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A MANUAL OF MEDICAL TREATMENT

ALSO BY DR. BURNEY YEO

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A MANUAL OF
MEDICAL TREATMENT
OR
CLINICAL THERAPEUTICS

BY

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FIFTH EDITION, BY

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IN TWO VOLUMES

VOL. I

CASSELL AND COMPANY, LTD
London, New York, Toronto and Melbourne
1913

First Edition *July* 1893
Reprinted January and March 1894

Second Edition *January* 1895
Reprinted September 1895, *January* 1897, *March* 1899,
June and September 1901

Third Edition *August* 1902. *Reprinted March* 1903, *August* 1904,
January 1906, *April* 1908

Fourth Edition *January* 1909. *Reprinted January* 1910,
February 1912

Fifth Edition *September* 1913

TO

HIS FRIENDS AND PUPILS

AMONGST THE PAST STUDENTS

OF

KING'S COLLEGE HOSPITAL

THIS WORK IS DEDICATED BY

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PREFACE TO THE FIFTH EDITION

The preparation of a New Edition of this work has been rendered necessary by the advances that have been made in Medicine since the publication of the Fourth Edition, which appeared in 1909, after careful revision by Dr. Raymond Crawfurd, Dr. Buzzard, and myself.

The present Edition will also be found to have undergone most careful revision, and some enlargement. Pains have been taken to prevent the work from becoming inconveniently large, but a moderate increase in size has had to be permitted in order to meet the constantly increasing demands which the examination of new therapeutic methods entails. The General Index, too, has been amplified.

In the present instance I have, I regret to say, been unable to share the work of revision, the whole of which has been undertaken by my very competent co-editors, Drs. Raymond Crawfurd and Buzzard—the section on Nervous Diseases by Dr. Buzzard, and all the remaining sections by Dr. Crawfurd. The work, however, retains the same

form and features which have gained for it so large a measure of approval in the past.

The advances made in the domain of vaccine-therapy, the use of the X-rays in diagnosis, and the serviceability of various physical methods of treatment have received consideration. An attempt has been made to exercise an adequate discrimination in examining these new therapeutic methods from a practical point of view, so as neither to extol them beyond their real merits nor by undue depreciation to discourage their pursuit.

I. BURNEY YEO.

August, 1913.

EXTRACT FROM PREFACE TO THE FIRST EDITION

The object of this work is the study of disease from the point of view of treatment. The teaching of Therapeutics is here approached from the side of the disease, and not from the side of the drug or remedy —a method which has been thought more natural and more interesting than the one usually adopted. It has not, however, been attempted to discuss questions of treatment apart from considerations of the clinical history, course, and pathological characters of each disease.

It is clear that any, or every, part of the natural history of a disease may bear, directly or indirectly, on its treatment, but some parts far more than others; and it would be most unphilosophical and unedifying to discuss the therapeutics of a disease without at the same time considering the true nature of the phenomena we are endeavouring to control.

It is by examining into the mode of *causation* of disease, by investigating the true nature of the morbid changes which underlie the *phenomena* of

disease, and by an exact knowledge of the properties and mode of action of the agencies we introduce for the purpose of influencing favourably its course, that what are termed *rational indications* for treatment are arrived at.

It has been the author's aim, therefore, in the following pages, wherever it was possible, to deduce rational indications for treatment from an examination of the pathological nature and the clinical course and characters of the disease under discussion.

Selections of formulæ, published for the most part by well-known physicians, are added to most of the chapters, for the purpose of giving completeness and breadth of view to the subject. Those in the first chapters are printed without any abbreviation, solely for educational reasons.

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A MANUAL OF MEDICAL TREATMENT

PART I.—DISEASES OF THE ORGANS OF DIGESTION

CHAPTER I

TREATMENT OF DISEASES OF THE MOUTH, GUMS, TONSILS, AND PHARYNX

STOMATITIS: Inflammation of the Mouth—Varieties: (1) Simple Catarrhal Stomatitis—Symptoms—Causes—*Treatment*. (2) Vesicular or Aphthous Stomatitis—Characters and Symptoms—Causation—*Treatment*. (3) Parasitic Stomatitis, Aphthæ or Thrush—Symptoms—Causes—*Treatment*—Prophylaxis. (4) Ulcerative or Pseudo-membranous Stomatitis—Symptoms and Characters—Causation—*Treatment*. (5) Gangrenous Stomatitis, Cancrum Oris, Noma—Causation—Characters and Symptoms—*Treatment*. (6) Mercurial Stomatitis—Symptoms—*Treatment*.

PYORRHŒA ALVEOLARIS: Causes—Bacteriology—Symptoms and Course—Prophylaxis—Hygiene of the Mouth—Dental Treatment—Vaccine-therapy.

TONSILLITIS: Varieties—Causes—Symptoms—Suppurative Form—*Treatment*—Prophylaxis. Chronic Hypertrophy of Tonsils—Follicular Tonsillitis—*Treatment*.

ACUTE PHARYNGEAL CATARRH: Angina, or Sore Throat—Characters—Causes—Symptoms—*Treatment*.

CHRONIC PHARYNGEAL CATARRH: Varieties: (1) Simple—(2) Follicular, or Granular—Causation—Symptoms—*Treatment*—Mineral Waters.

Additional Formulæ.

DISEASES OF THE MOUTH

THERE are several forms of inflammation of the mouth, the treatment of which we have to consider; and although the indications for treatment are in most of them similar, yet for the sake of clearness it will be

desirable to treat of each form separately, beginning with—

1. **Simple catarrhal stomatitis,** or **catarrh of the mouth.**—The principal **symptoms** of this affection are redness, tenderness, and swelling of the mucous membrane of the cheeks, gums, and tongue. The tongue is also covered with a thick fur, and shows the indentations of the teeth. The secretions of the mouth are increased, and its cavity is covered with thick yellow mucus. The sense of taste is blunted and perverted so that the patient complains especially of a "bad" taste, or a slimy, clammy, sometimes bitter taste, and a "foul" smell. In the form which accompanies dentition in infancy there is often much constitutional distress, and convulsions are sometimes induced.

The usual **causes** are insufficient attention to the cleanliness of the mouth in infants, dentition in childhood, the presence of carious or of badly arranged artificial teeth, the abuse of tobacco, of too highly-seasoned food and too hot beverages, and insufficient cleansing of the teeth and mouth in adults.

It is frequently associated with the febrile state, and often accompanies gastric catarrh and habitual constipation. It may also be propagated from adjacent inflamed organs, as in facial erysipelas and inflammation of the throat. If the oral mucosa becomes denuded of its epithelium, a purulent stomatitis may arise with discharge of pus from the ulcerated surface.

The **indications for treatment** are, *first*, the removal, when possible, of any of the causes enumerated above that may be found to exist; the sharp irritating edges of carious teeth must be removed, the smoking of strong cigars forbidden, and errors in food and drink corrected. Constipation must be relieved, and a saline aperient is almost always desirable. Coexistent gastric catarrh may require the administration of bismuth and alkalis. *Secondly*, emollient cleansing and antiseptic washes are needed to remove the foul secretions, to keep the oral cavity clean, and to soothe the irritation. At first lotions of tepid gum-

water or barley water, with 5 or 6 grains of bicarbonate of soda to the ounce, should be used. The carbonates of the alkalis exert a solvent action on mucus, and so serve to detach and wash away the foul, sticky mucous secretions covering the inflamed mucous membrane. If the mouth is very tender, this may be done with a soft camel-hair brush, or a piece of fine linen rag. Lime water, borax washes, and borax tabloids are useful. Chlorate of potash lotions are less serviceable in simple than in the severely septic forms of stomatitis. A wash containing salicylic acid 1 part, dissolved in 5 parts of alcohol, and added to 250 parts of water, has the advantage of acting both as an antiseptic and an anæsthetic, or boric acid solution may be used. Preparations of eucalyptus or hydrastis may be added to borax washes. As an astringent lotion a solution of alum (5 grains to the ounce) is sometimes useful.

In troublesome cases, and particularly if the surface epithelium is shed, the mucous membrane may be brushed with a solution of corrosive sublimate (1 in 5,000) or of nitrate of silver (2 grains to the ounce). If there is diarrhœa, astringents and opiates may be needed. Sucking fragments of ice will often relieve the heat and sensitiveness of the mouth. The following is a good formula for a mouth wash :—

℞ Boracis	... ...	drachmas duas (ʒij).
Sodii bicarbonatis	... ...	grana quadraginta (gr. xl).
Tincturæ eucalypti foliorum		unciam (ʒj).
Glycerini	... ...	semi unciam (ʒss).
Aquæ	... ...	ad uncias octo (ʒviij).

Misce, fiat lotio. To be used freely mixed with an equal quantity of warm water.

2. **Vesicular stomatitis,** also termed **aphthous stomatitis,** and **herpes of mouth,** and **aphthæ.**—In this affection small white spots (often termed aphthæ) appear on the mucous membrane of the mouth ; the spots are surrounded by a red border, and are said to be at first vesicular, but this is doubtful. The white spots are probably an exudation from the

free surface of the mucous membrane beneath the epithelium; these spots are thrown off, and raw excoriated surfaces left. They occur on the anterior half of the tongue, on the inner surface of the lips and cheeks, and on the hard palate; they are round, about the size of lentils, often numerous and apt to run together into confluent irregular patches. There is usually abundant mucous catarrh of the mouth, and increased salivation. The breath is foul from decaying epithelium, and the mouth is hot and painful. There are also feverishness and loss of appetite.

There is a mild recurrent form of vesicular stomatitis that is sometimes seen in association with a disordered stomach. It is apt to run in families, is chiefly excited by excess of sugar in the food, and is relieved as a rule in the course of a week by reducing the intake of sugar to a minimum.

With regard to its **causation**, it is more frequent in nurslings and children than in adults, and it is prone to occur in feeble, ill-nourished, scrofulous children during the period of dentition. It is also observed to accompany certain exanthemata, and particularly measles, as well as other cutaneous affections. It seems at times to be epidemic, especially amongst parturient women (*stomatitis materna*), and to spread by contagion. It is often found to occur in institutions where children are crowded together, with insanitary surroundings and unsuitable or insufficient food. It frequently accompanies exhausting and debilitating diseases. In the case of infants, scrupulous cleanliness of the mouth is the best preventive.

The **treatment** should be begun with a mild antacid laxative, such as rhubarb and magnesia. If, however, there is diarrhœa, a powder consisting of 2 to 4 grains of subnitrate of bismuth and 1 to 3 grains of compound kino powder (according to the age of the child), and 2 to 4 grains of sodium bicarbonate, may be given three times a day. Potassium

chlorate used to be regarded as a valuable remedy, but it has been denounced by some writers as causing great pain and doing no good.

The **local treatment** must consist at first in the use of demulcent alkaline and antiseptic washes.

A variety of antiseptic washes have been suggested, e.g. a solution of sulphite or hyposulphite of sodium, 30 grains to the ounce, creasote water, boric acid in saturated solution, borax washes, chlorine water, chlorinated soda solution, carbolic acid lotion (3 to 5 per cent.)—this has the advantage of being anæsthetic—the application by means of a camel-hair brush of dry alum, borax, or bismuth. If the spots are slow to heal they may be touched with solid nitrate of silver, or with a strong solution of the same (60 grains to the ounce), or with a solution of cupric sulphate (10 grains to the ounce), or zinc sulphate (20 grains to the ounce); or mercuric chloride (1 grain to the ounce) or iodoform may be applied.

Or the spots may be touched with *lapis divinus*, which is made by fusing together equal parts of cupric sulphate, alum, and potassic nitrate. In cachectic cases tonics must be given internally; quinine in $\frac{1}{2}$- to 2-grain doses with 2 to 5 minims of dilute nitric acid three or four times a day. The diet should be bland but nutritious, and stimulants are freely needed in bad cases. In young children milk and barley water, mixed, should be given, in preference to beef tea, as beef tea may cause smarting of the mouth.

Alkaline Emollient and Antiseptic Mouth Wash

℞ Glycerini acidi carbolici ... ... semi unciam (ʒss).
Sodii bicarbonatis ... ... drachmas duas (ʒij).
Decocti althææ ... ... ad uncias octo (ʒviij).
Misce, fiat lotio. To be used with an equal quantity of warm water.

Another

℞ Acidi borici ... ... drachmas duas (ʒij).
Glycerini ... ... drachmas duas (ʒij).
Decocti hordei ... ... ad uncias octo (ʒviij).
Misce, fiat lotio.

3. **Parasitic stomatitis, aphthæ, thrush.**—This disease has been confounded with the preceding; it is, however, a special form of inflammation of the mouth due to the development in its mucous membrane of a parasitic, fungous growth, the *Oidium albicans*. It commences with dusky redness, heat, dryness and tenderness of the mucous membrane, accompanied by an acid reaction of the buccal secretions; this is followed by the appearance of circular milk-white slightly prominent spots, which run together into irregular flakes or patches, covered with a peculiar white curd-like secretion. It is found on the dorsal surface of the tongue, on the inside of the lips and cheeks, and especially on the folds connecting the gums with the lips and cheeks; it extends also to other parts of the buccal membrane, and into the pharynx, whence it descends into the œsophagus. It has been found in the stomach and the cæcum (where the secretions are acid), and in cachectic states it is not unusual to find it round the anus and genital organs. The mouth is extremely sensitive, and sucking or mastication or any attempts at feeding by the mouth are painful and difficult. Sometimes it is attended by vomiting and diarrhœa. When it supervenes on low cachectic states it is usually of evil omen.

It is most common in infants during the first two weeks of life, and it is generally caused by want of cleanliness and deficient care in feeding, thus inducing a morbid acid condition of the oral secretions. It appears to be often conveyed from child to child by bottle-feeding. In older children, in adults, and in old people it is apt to appear towards the close of exhausting, cachectic diseases. It is contagious.

This fungus seems to require an acid medium for its development, and its occurrence in young infants has been supposed to be due to the preponderance of mucus, which is prone to turn acid, over the alkaline saliva in their oral secretions.

But some regard the acidity of the buccal secretion as rather a result than a cause of the growth.

The **indications for treatment** in this affection are, apart from those dependent on any coexisting cachexia, to remove the parasitic growth from the mucous membrane, and by restoring a healthy condition of the oral secretion to prevent its re-development. As a *preventive* measure it is desirable to wash out the mouths of weakly infants after suckling, and especially after using the bottle, with a piece of wet lint or a camel-hair brush soaked in water. To remove the parasitic patches it is best to rub them off gently with a piece of soft linen wrapped round the tip of the finger, and then cleanse the cavity of the mouth with some alkaline antiseptic wash, such as a 5 per cent. solution of borax or sodium benzoate. The following lotion may also be used every two or three hours :—

℞ Boracis ... ... } ana drachmas quatuor (ʒiv).
Glycerini ... ... }
Tincturæ myrrhæ ... drachmas duas (ʒij).
Aquæ camphoræ ... ad uncias octo (℥viij).
Misce, fiat lotio.

Or this :

℞ Sodii benzoatis... ... ... drachmas tres (ʒiij).
Sodii bicarbonatis ... ... grana centum (gr. c).
Aquæ rosæ ... ... ad uncias decem (℥x).
Misce, fiat lotio.

The above may also be used as a spray for the mouth and throat. Honey is to be avoided (as in *mel boracis*), since it may aggravate acid fermentation. But glycerinum acidi borici is a suitable preparation with which the patches may be frequently painted.

In obstinate cases the patches (after wiping) may be touched with a solution of argentic nitrate (1 to 2 per cent.), or cupric sulphate (2 grains to the ounce), or carbolic acid (2 grains to the ounce). Solutions of sulphurous acid (1 in 6) and of salicylic acid (1 in 250), and even of glycerine alone, have been found useful. If there is gastric disturbance, a mixture of tincture of rhubarb and bicarbonate of soda may be of service. If there should be diarrhœa, as is

not uncommon, small doses of bismuth carbonate with chalk mixture may be given to check it. Forchheimer says small doses of calomel act like a specific in intestinal troubles due to this parasite. With infants, whenever it is possible, a wet nurse should be preferred to artificial feeding. If this is impracticable, great care must be observed in the preparation of the infant's food—sterilised cow's milk mixed with a little lime water or a small quantity of a 5 per cent. solution of sodium bicarbonate should be used so as to ensure its having an alkaline reaction. Care should also be taken that the bottle, the nipple, and any vessels used in the preparation of the food are thoroughly clean. Plenty of fresh air and good sanitary surroundings should be secured. If owing to the sensitiveness of the mouth the child refuses to feed, a tube attached to a funnel may be passed along the floor of the nose into the pharynx and fluid nourishment thus administered. When this disease occurs in connection with some general cachexia, tonics and stimulants appropriate to the treatment of the constitutional affection must be given.

4. **Ulcerative stomatitis,** or **pseudo-membranous stomatitis.**—In this form of stomatitis the ulcers generally appear first on the outer border of the gums, especially of the lower jaw, and on the corresponding surface of the cheek and lip. They may extend to the tongue and palate, and the roots of the teeth are often laid bare by the ulcerative process. The ulcers are covered, as a rule, with whitish or dirty grey necrosed patches of mucous membrane, and surrounded by a red, swollen rim; they bleed easily. The tongue is swollen and thickly furred, indented by the teeth, and ulcerated at its edges. There are usually much fœtor of the breath, salivation, slight fever, and great sensitiveness of the mouth, and consequent difficulty in eating and swallowing. The submaxillary, sublingual, and retromaxillary glands on the affected side are swollen. If neglected,

this disease may cause necrosis of the alveolar processes and disruption of teeth; but when properly treated the ulcers clean and heal rapidly, but leave cicatrices.

This affection is usually found to arise in connection with insanitary dwellings and habits, insufficient and improper food, and other depressing agencies. It is often epidemic in hospitals, schools, prisons, camps, etc. It is especially prone to attack children, particularly feeble ones, between three and seven years of age, after measles. Carious teeth may act as an exciting cause, and it may originate in pyorrhœa alveolaris. It is probably contagious and microbic.

The **indications for treatment** are to remove unhealthy surroundings, improve the general health, and to restore a healthy condition of the buccal cavity and promote healing of the ulcers by soothing, cleansing, and antiseptic applications. Potassium chlorate appears to exert almost a specific influence over this disease, and it should be given internally and applied locally. Children may take 2 to 5 grains and adults 10 to 20 grains three or four times a day, and it may be prescribed locally in a mouth wash containing 10 to 20 grains to the ounce. This salt when swallowed is said to be excreted unchanged in the saliva. Other useful local applications are washes containing boric acid, salicylic acid, hydrogen peroxide, or permanganate of potash (1 in 1,000). If the mouth is very tender it may be irrigated frequently with these washes, laying the child's head first on one side, then on the other, so that the fluid may readily escape from the mouth.

The sensitiveness and tenderness of the mouth may be allayed by adding a little opium to the washes that are used. The mouth should be thoroughly cleansed with warm water after every meal, and the gums and teeth may be cleaned with a bit of absorbent cotton-wool. After this it has been recommended to wash the gums with a mixture of 2 parts of glycerine of borax and 1 part

of tincture of myrrh. If the ulcers are slow to heal, they may be touched twice daily with a solution of nitrate of silver (10 grains to the ounce), or with dry alum, or with tincture of iodine, or with iodoform; or a little precipitated sulphur may be insufflated over the ulcerated surface. As these applications are very painful, the ulcers may be first mopped with a solution of cocaine hydrochloride. When the infective process has effected a lodgment in the sockets of the teeth, it is useless to temporise with antiseptic lotions, which cannot get at the disease, and may be harmful by allowing necrosis of the jaw to set in. Nothing short of prompt removal of all the affected teeth will deal successfully with such a state of things. Such drastic treatment has in most cases the justification that the sufferer is in the period of first dentition.

Tonics of quinine and iron, together with cod-liver oil, will be needed in most cases, with good air and good food; the latter should be nourishing, but unirritating and easy of digestion. During the acute period, milk, beef-tea, soaked bread, and other nourishing fluids will be best. It may be necessary to resort to nasal feeding.

Antiseptic and Soothing Mouth Wash for Adults

℞ Potassii chloratis ... ... grana octoginta (gr. lxxx).
Extracti opii liquidi ... drachmas duas (ʒij).
Aquæ laurocerasi ... ... unciam (ʒj).
Decocti hordei ... ... ad uncias octo (ʒviij).
Misce, fiat lotio.

Antiseptic Salicylic Lotion

℞ Acidi salicylici ... ... semi drachmam (ʒss).
Spiritus vini rectificati ... drachmas tres (ʒiij).
Aquæ camphoræ ... ... ad uncias octo (ʒviij).
Misce, fiat lotio. (Dissolve the acid in the spirit and then add the water.)

5. **Gangrenous stomatitis, cancrum oris, noma.**—This very grave affection is, happily, rare. It occurs in children between 3 and 6 years of age, usually as a sequel or concomitant of some

exhausting disease in those that are ill nourished and of a strumous diathesis. Measles and enteric fever are the diseases it most commonly follows. It has also been encountered after whooping-cough and typhus. The excessive use of mercury has been said to favour its occurrence. It begins as a swelling of the cheek on one side, and spreads over the face. The mucous membrane lining the corresponding buccal surface is found to be ulcerated, and this ulceration spreads to the adjacent gums, so that the teeth become denuded and loosened, and the bone itself may be attacked and undergo necrosis. There is usually a hard, rounded nodule to be felt in the centre of the swollen cheek. A fœtid, gangrenous odour proceeds from the mouth. Gangrenous eschars form both externally and internally. These separate and leave a hole in the cheek, exposing the diseased jaw and denuded teeth. The general condition is one of profound toxæmia. Infective broncho-pneumonia often supervenes, and diarrhœa, and the disease is commonly fatal during the second week. Recovery sometimes occurs before the cheek becomes perforated, but ordinarily great deformity is left behind from extensive gangrene of the face, nose, and adjacent parts. It is said to be fatal in at least 75 per cent. of cases.

Treatment.—This consists mainly in excision by the knife, or local destruction by Paquelin's cautery or pure nitric acid.

After carefully drying the parts with lint, a glass brush should be dipped in strong nitric acid and applied freely to the sloughing parts, and over the surface of the gums, any loose sloughs being previously cut away and sequestra removed. Care must be taken that the acid does not run over the sound skin. After the acid has been allowed to act for 5 to 10 minutes, it should be neutralised by washing with a strong solution of bicarbonate of soda, until all effervescence ceases, so as to prevent pain. The wound should then be dressed with iodoform gauze. Some prefer hydrochloric acid or the acid solution of

mercuric nitrate, and others prefer the use of Paquelin's cautery. After cauterisation, antiseptic washes or injections or sprays must be used day and night to cleanse the mouth of dead and decomposing matter.

Beneficial results have been reported from the local application of undiluted carbolic acid, followed by the frequent use of a 2 per cent. wash of the same; one case recovering without perforation of the cheek. Other local applications reported to have been followed by good results are the pure tincture of perchloride of iron, solution of copper sulphate (30 grains to the ounce), and subnitrate of bismuth. Successful treatment of this affection has been reported by swabbing the ulcerated surfaces with a 1 in 1,000 solution of perchloride of mercury.

For cleansing the mouth chlorinated soda lotions may be used (liquor sodæ chlorinatæ, 1 ounce; aquæ ad 16 ounces), or a 5 per cent. solution of carbolic acid. The child should be kept, as far as possible, in a position in which the discharges will flow out of the mouth, and not down the throat. This is some safeguard against insufflation broncho-pneumonia. Complete isolation from other children is imperative, and free access of fresh air should be ensured.

Tonics should be freely given, especially quinine and perchloride of iron; as well as an abundance of nourishing food and stimulants; as much wine and brandy as the child will take—3 to 4 ounces in twenty-four hours for a child of 5 years. Eggs beaten up with milk, strong soups, wine-whey, pounded meat, are the best foods. Feeding by means of a nasal tube may be necessary.

The troublesome scars and deformities left behind in cases that recover may be remedied by appropriate plastic operation.

6. **Mercurial stomatitis,** or mercurial salivation, is caused, as its name implies, by intoxication with mercury, either given as a medicine, or from contact with the metal in the arts.

The **symptoms** consist of a peculiar fœtor of

the breath, a metallic taste, soreness of the gums and mouth, and profuse secretion of saliva. The lips, the tongue, and the whole of the buccal mucous membrane become involved. The lymphatic glands of the lower jaw are enlarged and painful; the tongue is sometimes greatly swollen, and mastication and swallowing are difficult. If this affection proceeds unchecked it may take the form of ulcerative stomatitis, and occasionally necrosis of the lower maxilla occurs. It varies greatly in severity, and in its manifestations and duration.

The **treatment** of this form of stomatitis requires, in the first place, that the patient should be withdrawn immediately from the influence of the metal. It is said that the administration of potassic chlorate acts as a prophylactic with workers in the metal. This is also one of the best remedies for the disease: 30 to 60 grains a day is usually quickly followed by amelioration and cure. It soon removes the characteristic fœtor. Antiseptic and cleansing mouth-washes are needful, to which some opium may be added (as well as given internally) to relieve pain. The best are solutions of potassic chlorate, creasote water, borax with tinctures of myrrh and cinchona, saponified emulsion of coal-tar, brandy and water lotion (Watson). Sometimes a wash of acetate of lead (10 grains to the ounce) proves very soothing, and some think highly of an iodine wash ($\frac{1}{2}$ dram of the tincture to an ounce of water). Cauterisation is occasionally needed either with nitrate of silver or hydrochloric or chromic acid (1 in 5). To check the excessive salivation a tannin lotion will prove serviceable (1 dram of glycerine of tannin to an ounce of rose-water); or this distressing symptom may be controlled by belladonna (5 to 10 minims of the tincture every four or five hours), or a hypodermic injection of atropine ($\frac{1}{120}$ grain) may be given. *Internally*, besides potassic chlorate, as already mentioned, tonics are indicated, and nitric acid has been found especially useful—10 minims of the dilute acid

with a grain or two of quinine in an ounce of water, three or four times a day.

As mastication may be impossible and swallowing difficult, either fluid or soft pulpy foods must be administered. Milk, beef-tea, whipped eggs, pounded meat mixed with nourishing soups, soaked stale bread made into a thin pap with milk, oatmeal gruel, and other fluid foods may be given. If swallowing should be especially difficult and painful, nutrient enemata must be administered.

Diseases of the Gums

Pyorrhœa alveolaris, or *Rigg's disease,* is an infective condition of the sockets of the teeth, leading to the formation of a purulent discharge around the teeth, and, if neglected, to actual caries of the bony sockets and loss of the teeth. It seldom occurs before adult age, and may often be traced to insufficient care of the teeth, so that particles of food effect a lodgment beneath the margins of the gums, or tartar collects around the teeth. In either case a soil is prepared for bacterial infection, which readily occurs. The bacteriology of the condition is complex, owing to the variety of organisms that habitually infest the mouth, but a streptococcus is far the most frequent offender: staphylococci, pneumococci, the micrococcus catarrhalis, and others have also been identified causally with the disease. Disorders of general health are at most a contributory cause, but pyorrhœa may, in some instances, excite grave general or local troubles. As might be expected, there are not a few who attribute to pyorrhœa the majority of human ailments.

Attention is usually attracted to the condition by the angry appearance of the margin of the gums, and purulent discharge may be visible. When it is not, gentle pressure on the gum, beginning at the apex of the tooth, and gradually advancing to the neck, may serve to bring it to light. The affected teeth and gums are sometimes very sensitive, and as the process

advances the teeth become loosened in their sockets by periodontal suppuration along with recession of the gums.

From what has been said it will be evident that scrupulous attention throughout life to the hygiene of the mouth is the best preventive. The teeth should be thoroughly brushed, inside and out, on rising and also at bedtime. Antiseptic lotions, such as listerine or sanitas, added to the water are preferable to antiseptic tooth-powders; the addition of a little eau-de-Cologne is pleasant and has a local astringent effect. The accumulation of tartar should be prevented by regular visits to a dentist.

Once the condition has appeared, prompt local treatment by a dentist is essential. All deposits on the surface of the teeth must be mechanically removed, and the periodontal pockets flushed with solution of hydrogen peroxide, or a 2 per cent. carbolic acid lotion. Subsequently the teeth should be brushed, as described above, after every meal. If treatment on these lines is diligently carried out, the slighter forms of the disease will usually be arrested. When such is not the case, an attempt may be made to deal with the condition by means of vaccine-therapy, which is often rendered difficult by the existence of a polymicrobic infection. By careful cleansing of the gums, before making any attempt to press out the pus from the deeper part of the socket, this difficulty may be largely reduced. In cases of doubt, the very frequency of a streptococcal infection will suggest the employment of a stock streptococcal vaccine, commencing with an initial dose of 6 millions. Vaccine enthusiasts claim for this treatment more brilliant results than we have ourselves obtained with vaccines prepared and administered under the guidance of experts in vaccine-therapy. Local treatment is certainly the most important agent in effecting a cure. When all other measures fail, and particularly if the general health is involved, it is best to recommend extraction of the affected teeth.

Diseases of the Tonsils

Tonsillitis.—The tonsils in some persons are very prone to inflammation. Three principal kinds of tonsillitis have been described, but there is no strict line of demarcation between the types. First, a *catarrhal* or *superficial* form, in which the mucous membrane only is inflamed; but this is only a part of an ordinary sore throat or catarrhal pharyngitis (angina catarrhalis). Secondly, a *follicular* or *lacunar* tonsillitis, when the follicles especially are inflamed and plugged with exudation; this also may be a part of a general pharyngitis. Neither calls for any special treatment apart from that of the general affection of the pharynx. Thirdly, a *suppurative peritonsillitis* or **quinsy.** In quinsy, although the tonsil is inflamed and swollen, the pus is not in the tonsil, but in the areolar tissue beside it. In the large majority of cases the abscess forms above and in front of the tonsil, rarely outside or behind it. It will be realised how important is a knowledge of the relation of the pus to the tonsil when the question of surgical relief arises.

As to the causes of tonsillitis, constitutional predisposition is a very prominent one. Some persons appear to inherit a peculiar susceptibility to acute inflammation of the tonsils, and will suffer during their lives from repeated attacks. This is particularly the case where there is existing chronic enlargement. "Scrofula" is particularly apt to be found associated with the more chronic and permanent forms of early childhood; rheumatism and gout with the severe acute forms of youth and of adult life. Attacks of acute rheumatism have often been observed to be preceded by attacks of acute tonsillitis; and it is thought probable that the poison of rheumatic fever gains entrance into the body through the tonsils. The exanthemata are associated not infrequently with tonsillitis; indeed, the belief is gaining ground that the tonsils play an

important part in admitting into the system the various pathogenetic microbes that give rise to infectious diseases, while its own affections are doubtless the consequence of microbic activity.

The **symptoms** of acute parenchymatous tonsillitis are highly characteristic. Fever is usually present from the onset, and the temperature frequently reaches 104° or 105° F. Pain, often extending into the ear, and difficulty in swallowing and a feeling of soreness and heat in the throat call attention to that part, and on looking into the throat one or both tonsils will be found to be red, swollen, and projecting into the pharynx. Both may be involved together; often they will be seen nearly or quite touching one another, and filling up the whole of the entrance to the pharynx: more commonly the inflammation of the second tonsil follows that of the first. The soft palate and uvula share in the inflammation, the mucous membrane being intensely red and inflamed, and the whole uvula being swollen and elongated. The inflamed parts, at first dry, soon become covered with a viscid, sticky mucus, and, owing to the obstruction in the throat and consequent difficulty of swallowing, the saliva escapes freely from the mouth. Pain and swelling about the angle of the jaw, which sometimes extend to the adjacent salivary glands, make it difficult for the patient to open the mouth so as to permit of full inspection of the throat, and the forefinger must be introduced to explore the condition of the tonsils. Besides the other symptoms of fever there are usually headache, restlessness, a thickly coated tongue, foul breath, nausea, loss of appetite, constipation, and scanty, high-coloured urine.

The inflammation of the tonsil may end in resolution or suppuration.

In the former case the parts may be restored to their natural condition in ten or twelve days, but frequently more or less permanent enlargement of the tonsil remains. In suppurative cases, after four or five days, the occurrence of slight rigors and the

complaint of throbbing pain and great tension in the inflamed tonsil indicate that pus has formed there. Usually the abscess bursts suddenly, sometimes during sleep, and its contents are swallowed; or it is discharged from the mouth—great and immediate relief accompanying this termination.

In the **treatment** of acute tonsillitis, the first point is to determine by means of a culture whether or no the inflammation is of diphtherial origin. In other cases much may be done, if the case is seen early, to prevent suppuration, or, when this result is inevitable, to hasten it. In young children, and in some young adults, most acute throat affections are very amenable to the influence of aconite. It is of little use in older patients, and its use, in all cases, is pretty well limited to the first twenty-four hours. If it has not had by that time a marked effect on the fever and the throat discomfort it is as well to lay it aside for some other remedy. A child between 5 and 10 years of age should be given 1 or 2 minims of tincture of aconite (or a pilule of aconitine containing $\frac{1}{480}$ grain), with a dram of liquor ammonii acetatis and a little syrup of orange peel and water, every two or three hours, for six doses; from 10 to 15 years 2-minim, and above 15 years 3-minim doses may be given. This remedy will sometimes remove rapidly the early inflammatory throat affection in children. A saline aperient should always be given at starting.

For children a powder that is tasteless has such an advantage over other medicines that we may give one containing a grain of calomel mixed with 2 grains of sugar, and wash it down with two tablespoonfuls of Dinneford's fluid magnesia mixed with a teaspoonful of syrup of lemons; this mixture makes a pleasant, cooling drink, which may be repeated every hour until the bowels are freely relieved. Mouthfuls of iced milk and water are useful in this stage, combined with ice-cold compresses externally.

For older patients and in all pronounced rheumatic cases sodium salicylate may be given in full doses, to an adult 10 to 15 grains, every two or three hours, until relief is felt.

Some apply a lotion of salicylic acid directly to the surface of the tonsil by means of a spray.

We also think highly of the remedial effects of guaiacum for adults; patients who have gone through former attacks with and without this drug know its value, although they dislike taking it. An ounce of the guaiacum mixture of the B.P. should be given every four hours; or a teaspoonful of the ammoniated tincture may be added to half a glass of milk, and this mixture may be used as a gargle and then swallowed. It should be taken every two hours, until it begins to purge; or in mild cases guaiacum lozenges—5 to 6 a day—may be allowed to dissolve slowly in the mouth.

An active saline purgative must also be given, such as 2 drams of sodium or magnesium sulphate with 20 grains of magnesium carbonate in an ounce of peppermint water, every four hours, until free action of the bowels is established.

A great deal of discomfort in cases of acute tonsillitis, more particularly of suppurative type, is occasioned by the accumulation of stringy adherent mucus about the fauces and mouth. This may be removed by syringing the mouth freely with a lotion of borax (10 grains), chlorate of potash (10 grains), oil of eucalyptus (1 minim) to the ounce of water, mixed before use with an equal quantity of hot water. The forcible stream of a syringe is more efficacious than the feeble sprays.

When the disease cannot be arrested, a spray of cocaine (1 per cent.) combined with menthol (10 per cent.) dissolved in paroleine, sprayed with an atomiser, will relieve the pain. The menthol has the advantage of being also an antiseptic. Stronger cocaine solutions must not be used, for they are apt to aggravate the pain as the anæsthetic effect passes off.

In severe cases, and for hastening suppuration, we have found nothing more efficacious than a gargle of hot water containing about 2 grains of borax or of sodium bicarbonate to the ounce; the patient should be directed to keep gargling or holding this in his mouth as constantly as possible. Inhaling the steam of hot water, or hot water containing some aromatic substance such as benzoin, camomile, sage, hops, camphor, or opium, is also very useful. Externally, profuse hot fomentations, applied frequently with a large sponge, the head and neck being held over a large basin, and in the intervals hot moist sponges fastened round the throat, greatly hasten the progress of the case. If we can distinctly satisfy ourselves that there is a superficial collection of pus, by finding a spot that is soft and boggy to the finger or the end of the forceps, we should at once let it out. The mistake is often made of puncturing the tonsil itself, because it is the most prominent part of the swelling: hence it is that patients constantly complain of being uselessly put to pain by these punctures, which appear to give no relief. StClair Thomson points out that to reach the abscess the soft palate must usually be traversed, and the site of election is located as follows: If an imaginary horizontal line is drawn across the base of the uvula, and another vertically along the anterior faucial pillar, they will intersect at a point overlying the supratonsillar fossa. Just external to this is, as a rule, the best point for opening a quinsy. He recommends a pair of fine-pointed sinus forceps, the blades of which can be separated as the forceps are withdrawn after puncturing the abscess. In children light general anæsthesia is required, either with nitrous oxide, ethyl chloride, or ether: in adults local anæsthesia with cocaine will suffice.

If the temperature keeps high in cases of acute tonsillitis it is advisable to give full doses of quinine, 4 to 5 grains dissolved in lemon juice and water, every three or four hours, until the temperature is reduced.

After suppuration and discharge of the abscess, tonic treatment is needed—bark and ammonia in rheumatic cases, or quinine and acid in non-rheumatic cases, or iron and quinine in cases of great debility.

The following antiseptic gargle after incision is recommended by Schnitzler:—

℞ Sodii salicylatis ... } ana grana quadraginta (gr. xl).
Boracis ... ... }
Aquæ laurocerasi ... drachmam (ʒj).
Aquæ destillatæ ... ad uncias octo (ʒviij).
Misce, fiat gargarisma.

Solution of hydrogen peroxide, diluted with 2 parts of water, may be used for the same purpose.

The employment of a weak iodine gargle or spray (1 dram of tincture of iodine and half an ounce of glycerine to 8 ounces of water) is also of use for this purpose, as is the syrup of the iodide of iron with cod-liver oil, especially in scrofulous cases; in which also change to the seaside, if the season is suitable, with local and general sea-bathing, favours complete recovery.

Food during the acute stage must be fluid, and milk is the best. In the early stage, and whilst there are prospects of securing resolution, the milk should be mixed with ice-water, but in a more advanced stage, and when the object is to hasten suppuration, it should be drunk warm, or even as hot as it can be tolerated, diluted with $\frac{1}{3}$ part of seltzer or Apollinaris water. Sometimes liquid food is taken with difficulty, and semi-solids, such as baked custard, blancmange, and jellies, are more easily swallowed. Persons prone to repeated attacks of quinsy should be recommended, as a *prophylactic*, to sponge the throat and back of the neck daily with cold water, or direct a cold spray douche over these parts. The throat should also be gargled every morning with cold water containing 2 or 3 grains of borax and a few drops of tincture of myrrh to the ounce.

Chronic enlargement of the tonsils (hypertrophy) is often found in children. In slight degree

it has no pathological importance, and is apt to disappear at puberty. But if it reaches to such a degree as to cause deafness, seriously to embarrass respiration, and to check physical development, it requires the removal of the hypertrophied organs. Slight degrees of enlargement following acute tonsillitis may be greatly benefited by iodine gargles or sprays (as already suggested) or the local application of glycerine of tannin or of chromic acid (10 grains to the ounce). If removal is determined upon, the best instrument for the purpose is Mackenzie's guillotine, unless the tonsils are very large, long, and narrow; then enucleation, or removal by the tonsil-punch, will be necessary. Bleeding after the operation is best prevented by remaining quietly in bed for two or three days, while all food should be fluid and cold, and the bowels kept freely open by a saline purge. Slight oozing may be checked by brushing the cut surface with adrenalin solution, and sucking fragments of ice. If there is more copious bleeding from a torn vein, as sometimes happens on removal of an adult fibrous tonsil, the vessel must be picked up with forceps and clamped.

In the **follicular tonsillitis** which often accompanies certain forms of pharyngitis a gargle of creolin has been found very useful. The throat should be gargled several times a day with equal parts of a 1 per cent. solution and warm water. The pricking sensation it leaves in the throat may be relieved by gargling afterwards with pure warm water. Some prefer to use a probe tipped with cotton-wool, and soaked in 1 in 1,000 perchloride of mercury, or in peroxide of hydrogen solution, so as to explore the follicles themselves.

Diseases of the Pharynx

Acute pharyngeal catarrh (*sore throat, angina*).—In this disease, as in tonsillitis, the inflammation is not confined to any special part of the throat, but extends usually to the whole throat. The soft palate and uvula are almost invariably affected, and the

faucial arches often more so than any other part; the catarrhal state also commonly extends to the back of the nose (post-nasal), into the mouth, and to the epiglottis and larynx. Hence the more general term "sore throat" is preferable.

Usually, and in mild forms, there is simply an erythematous inflammation of the mucous membrane of the pharynx, palate, and tonsils, which, under favourable conditions, subsides in a few days. In more severe cases there is more swelling and great relaxation of the mucous membrane, which may be intensely congested and œdematous. The mucous follicles are often swollen, and the mucous membrane is usually covered with a secretion of dirty-looking, dryish, sticky mucus. The uvula also is elongated and swollen. Suppuration (suppurative pharyngitis) is apt to occur in enfeebled persons, as well as in severe traumatic cases. Ulceration (ulcerative pharyngitis or ulcerated sore throat) frequently occurs, especially in septic cases.

The most common **cause** of the simple forms of acute pharyngitis is exposure to cold and damp: the ulcerative forms (when not specific) are usually caused by breathing a septic atmosphere, as in the so-called "hospital throats," "drain throats," etc. Pharyngitis may, of course, be caused by contact with mechanical and chemical irritants in the solid, liquid, or gaseous form; or may be excited by the contact of highly-heated steam or other hot fluid or solid substances, or by tobacco smoke. It accompanies most of the exanthemata, and in scarlet fever occasionally assumes a very serious aspect. It is sometimes epidemic, and may accompany epidemics of true diphtheria.

It is doubtless in many cases due to microbic infection; in others it is associated with the rheumatic or gouty diathesis.

The **symptoms** commonly complained of are heat, dryness, tension, and uneasiness in the throat; some dysphagia, slight modification of the voice, and

occasional hoarseness. There is usually some fever, and in some persons, if the temperature is taken in the mouth, it will be found out of all proportion to the general constitutional state. We have often observed a temperature as high as 104° F. for a few hours during the height of the inflammation; 101° to 102° is, however, far more common. In cases which are referable to chill there is often complaint of pain or aching in the back and limbs; the cervical glands are occasionally swollen.

The **treatment** of the milder cases of superficial pharyngitis is simple. Confinement to the house and the strict avoidance of exposure to cold currents of air are essential. If the bowels have not been freely relieved, and if the tongue and mouth are foul and sticky, a saline aperient should be given—a seidlitz powder, or 3 or 4 ounces of Dinneford's fluid magnesia with a teaspoonful of lemon-juice, will often be sufficient. This is often, however, advantageously preceded by a pill of 1 grain of calomel and 2 grains of extract of henbane. If there has been troublesome constipation before the attack a stronger dose will be needed, and an ounce and a half of the mistura sennæ composita may be ordered. If the attack has been brought on by exposure to cold and damp, and is accompanied by pain and aching in the limbs, a diaphoretic draught should be given at bedtime, and the patient be enjoined to keep his room at least for a day or two. This draught may consist of—

℞ Salicini	... ...	grana quindecim (gr. xv).
Liquoris ammonii acetatis		drachmas tres (ʒiij).
Spiritus ætheris nitrosi	...	drachmam (ʒj).
Aquæ camphoræ	... ...	ad unciam cum semisse (ʒjss).

Misce, fiat haustus. To be taken at bedtime.

If there is much pain in the throat, an eighth to a sixth of a grain of acetate of morphine may be added to this draught. In many cases salicin may be given with advantage in doses of 15 to 20 grains three times a day, for some days. In young children,

if there is a high temperature, tincture of aconite or granules of aconitine ($\frac{1}{450}$ grain), given in the manner already described for tonsillitis, will often act remarkably well. There are many lozenges that will be found also to exert a soothing influence on the soreness of the throat. Chlorate of potash, or carbolic acid, or cocaine and menthol lozenges, or glycerine jujubes, are all useful: several of these may be allowed to dissolve slowly in the mouth during the twenty-four hours.

The inhalation of vapour of benzoin given off from very hot water (1 dram of the tincture to a pint of hot water) is soothing, but of no great curative efficacy.

In septic cases, with much depression of strength as well as fever, we prefer, after the bowels have been relieved, to give quinine and potassium chlorate in effervescence, as follows:—

℞ Potassii chloratis ... ... grana decim (gr. x).
Potassii bicarbonatis ... ... grana viginti (gr. xx).
Ammonii carbonatis ... ... grana quinque (gr. v).
Syrupi aurantii ... ... drachmam (ʒj).
Aquæ ... ... ad unciam (℥j).

Misce, fiat haustus. To be given every three or four hours with the following powder:—

℞ Quininæ sulphatis ... ... { granum cum semisse ad grana tres (gr. jss ad iij).
Acidi citrici ... ... grana viginti (gr. xx).

Misce, fiat pulvis.

Half these doses can be given to children between seven and fourteen years of age. The dryness and heat of the throat may be relieved by sucking fragments of ice or sipping iced lemonade. A cold compress applied to the throat is also useful. When associated with rheumatism, salicin and the salicylates are indicated, and when with gout, colchicum and alkalis.

The diet should be light and nourishing, and may consist of milk, of whipped eggs, of oatmeal gruel, of broths, beef-tea, fruit jellies, and the like. When there is much relaxation of the mucous membrane,

and much sticky mucus hanging about the throat, great comfort is experienced from the use of an alkaline and astringent gargle such as the following, which cleans away the mucus and braces up the relaxed mucous membrane :—

℞ Sodii bicarbonatis	... ...	drachmam (ʒj).
Glycerini boracis	... ...	unciam (℥j).
Potassii chloratis	... ...	drachmas duas (ʒij).
Tincturæ catechu	... ...	drachmas duas (ʒij).
Aquæ rosæ ...	... ...	ad uncias duodecim (℥xij).

Misce, fiat gargarisma. To be used warm.

In cases of intense inflammation, with much swelling of the mucous membrane and great pain, so that gargling is not possible, a spray of warm water containing 5 grains of sodium bicarbonate and 2 or 3 of sodium chloride, and 20 minims of glycerine of carbolic acid to the ounce, is very comforting; or the throat may be irrigated with warm saline solution.

After cleansing the throat of adherent mucus by a warm alkaline gargle, great comfort may often be given by the application of a 5 per cent. solution of **cocaine** by means of a camel-hair brush.

Later, when the relaxation of the mucous membrane is chiefly distressing, sprays containing alum (5 grains to the ounce) or tannin (5 to 10 grains to the ounce), with or without ammonium chloride (5 to 10 grains to the ounce), may be used with advantage.

In some low forms of ulcerative (septic) sore throat, vigorous tonic treatment may be needed, and a mixture containing 2 or 3 grains of quinine and 15 or 20 minims of tincture of perchloride of iron should be given every four or five hours. Three or four glasses of sound port wine are often also needed daily. In these cases the throat should be washed out (the attempt to gargle is too painful) with an antiseptic wash ; a saturated solution of boric acid to which a little tincture of myrrh is added will answer the purpose.

Chronic pharyngeal catarrh (*chronic sore throat*). — The pharyngeal mucous membrane, on

account of its anatomical relations, is apt to be involved in affections of both the digestive and respiratory tracts. Obstruction in the nose or naso-pharynx is apt to lead to chronic catarrh, from the drying effect of air, when admitted direct into the pharynx without being warmed or moistened by passage over the naso-pharyngeal mucosa. Chronic pharyngitis has been divided into two varieties according as the glandular follicles are or are not conspicuously affected. In the latter case we have (1) *simple chronic catarrhal* sore throat, and in the former (2) *follicular* or *granular* pharyngitis, or clergyman's sore throat.

The chronic form of *catarrhal* sore throat usually follows repeated attacks of the acute disease, and has, therefore, the same etiology. The *follicular* form is predisposed to by sedentary occupations and unhealthy habitations, and the exciting causes are usually excessive use of the voice in speaking and singing, or local irritation from tobacco or alcohol, or food and drinks too highly spiced or too hot, or too hot and too cold together. It sometimes follows acute pharyngitis, and sometimes seems to be chronic from the outset. It is common in the scrofulous, and not infrequent in the rheumatic and gouty.

In follicular pharyngitis the pharynx is seen covered with small projections varying in size from that of a pin's head to three or four times this size. Patches of dirty yellowish or brownish adherent mucus also cover the surface of the mucous membrane. In very old cases of this kind, when atrophy of the glandular structures has taken place, we get a variety known as *pharyngitis sicca* or *atrophic* pharyngitis (dry catarrh). In these cases a scanty, dry secretion is seen covering the thin, hard, glazed mucous membrane.

The **symptoms** complained of in chronic pharyngeal catarrh are an uncomfortable, sticky feeling in the throat, with a constant desire to "clear the throat" by coughing or "hacking." There is usually

more or less expectoration, and if this is dry and sticky, and not easily detached from the mucous membrane, there may be a good deal of dry, irritative cough. The cough is often troublesome on lying down at night, especially when the catarrhal condition extends into the posterior nares. This, we believe, is caused by the larynx, in the horizontal position, falling back against the posterior wall of the pharynx, so that the excessive secretion from the catarrhal mucous membrane drains, as it were, into the larynx, or hangs about the glottis and excites efforts at coughing to get rid of it. The voice is often thick and coarse, and the throat gets "fatigued" after much vocal exertion, as in public speaking, singing, etc.

In the **treatment** of chronic pharyngitis, improvement of the general health must be our first consideration. If there is coexistent gastric catarrh we must endeavour to remove this by careful attention to diet and habits and a proper regulation of the bowels. Strong alcoholic drinks and all hot and irritating articles of food must be forbidden, as well as the use of tobacco, which undoubtedly is the cause of much troublesome catarrh, both gastric and pharyngeal.

If there is reason to refer the condition to excessive or improper use of the voice, or to disease of the nose or naso-pharynx, these must receive appropriate treatment.

If there is chronic constipation, a small pill containing half a grain of powdered ipecacuanha, a grain of aloes, and half a grain of soap should be taken daily immediately before dinner, and a tumblerful of hot Carlsbad water should be drunk the first thing in the morning. This will cleanse the stomach of adherent mucus and promote its healthy secretions. It is an excellent plan also to drink and at the same time gargle the throat with a warm alkaline water about an hour before each meal—Ems or Vichy water will do.

In scrofulous conditions, as soon as the tongue is

clean and the stomach in good order, we should give cod-liver oil and syrup of the iodide of iron, and in anæmic and debilitated cases quinine and strychnine and tincture of the perchloride of iron. In some gouty and rheumatic cases small doses of iodide of potassium with a bitter vegetable tonic will be of use, and in others the alkaline and arsenical Bourboule water will be found of great service; 4 to 6 ounces should be drunk warm night and morning, and an hour before dinner; it should be drunk slowly, and kept in contact with the throat while swallowing. Topical astringents are of great value in many cases, but they should not be applied until the throat has been first cleansed from adherent mucus by gargling with a warm alkaline solution.

The free application of a solution of nitrate of silver, from 3 to 5 grains to the ounce, in that form of chronic pharyngitis which follows acute attacks, is exceedingly useful. A solution of chloride of zinc, 3 to 5 grains to the ounce, is also an excellent application, applied daily to the throat with a large soft brush. Some apply a mixture of nitrate of bismuth with glycerine, 10 grains to the ounce, with a brush, and find it relieves the local discomfort; a solution of tannin in ether has been recommended by others. It is said to answer admirably in some cases, as it leaves a thin film of tannin on the surface. All these applications require to be made by a medical man; it is necessary, therefore, to have other resources which we can entrust to the patients themselves. Sprays are very useful for this purpose. Tar-water applied in this way often renders good service; or a warm solution of borax (8 to 10 grains to the ounce), or a solution of sodium bicarbonate and ammonium chloride of the same strength. In mild, chronic cases gargles are of much service. An ounce of glycerine of borax and half an ounce of tincture of myrrh with 12 ounces of rose-water make a pleasant

and useful gargle. Sometimes it will be found of use to irrigate the nose and naso-pharynx as well.

If the mucous membrane and uvula are much relaxed a good astringent gargle may be made with 5 drams of glycerine of alum, 20 minims of tincture of capsicum, and 8 ounces of the acid infusion of roses.

There are many useful forms of lozenges for these cases; some serve to detach the sticky mucus and promote expectoration and so relieve cough, such as the ammonium chloride lozenges, the Soden pastilles, and the pastilles Dethan (a French chlorate of potash lozenge flavoured with benzoin). Or the astringent lozenges are more useful in other cases, such as the red-gum lozenge, the rhatany, catechu, and tannin with capsicum lozenge.

Guaiacum pastilles are useful in rheumatic forms, and codeine pastilles to relieve the troublesome night-cough so often a source of annoyance.

The following has been recommended as a good prophylactic application in "threatened" sore throat:

℞ Acidi tannici ...	... ...	grana duodecim (gr. xij).
Tincturæ iodi ...	... ...	minima quinque (♏v).
Acidi carbolici	... ...	grana triginta (gr. xxx).
Glycerini ...	... ...	semi unciam (ʒss).
Aquæ	... ...	ad uncias tres (ʒiij).

Misce, fiat lotio. The throat to be painted with this three times a day.

Old cases of *follicular* pharyngitis are exceedingly difficult of cure. Some specialists recommend applications of very strong solutions of nitrate of silver (1 dram or 2 drams to the ounce), or iodine and carbolic acid (1 dram of each to an ounce of glycerine). We prefer much weaker solutions of iodine, 5 to 10 grains to the ounce of glycerine, and half a dram of iodide of potassium may also be added. The dilated capillaries are said to be sometimes benefited by the local application of the liquid extract of ergot, or a solution of ergotine (10 to 20 grains to the ounce). The local destruction of the enlarged follicles is also a favourite method of treatment,

either by such caustics as solid nitrate of silver, or chloride of zinc, or caustic potash, or the incandescent electric cautery.

We have found in the less inveterate cases much service from the use of Bourboule water, as described above, or the Eaux Bonnes or the Cauterets water. We have also had good results from a course of treatment at these places. Excellent results are reported by the physicians at Aix-la-Chapelle, especially from the use of inhalations of the combined spray and vapour of their saline sulphur water. At the same time general tonic treatment is always indicated.

ADDITIONAL FORMULÆ

Tonic mixture for ulcerative stomatitis

℞ Potassii chloratis, ʒiv.
Tincturæ ferri perchloridi, ʒiv.
Glycerini, ʒj.
Aquæ destillatæ ad ℥xij.
M. f. mist. A tablespoonful four times a day in a little water. (*Whitla.*)

Mouth-wash for spongy gums

℞ Tincturæ myrrhæ
Tincturæ krameriæ
Tincturæ cinchonæ
Tincturæ catechu
āā ʒiv.
Aquæ Coloniensis, ℥j.
M. A large teaspoonful in a wineglassful of water, to be used as a mouth-wash frequently. (*Whitla.*)

Cocaine paint for pharyngeal hyperæsthesia

℞ Cocainæ hydrochloridi, gr. iij.
Glycerini, ♏xxx.
Aquæ destillatæ, ʒij.
M. f. pigmentum. (*Schnitzler.*)

Gargle in catarrhal pharyngitis (angina)

℞ Aluminis, ʒjss.
Tincturæ opii, ʒss.
Mellis, ʒij.
Syrupi rosæ, ʒiij.
Aquæ ad ℥viij.
M. f. gargar. (*Bamberger.*)

Mouth-wash for mercurial stomatitis

℞ Potassii chloratis, ʒij.
Tincturæ opii, ♏xx.
Aquæ laurocerasi, ℥j.
Aquæ ad ℥vj.
M. f. lotio. (*Gosselin.*)

Gargle for relaxed throat

℞ Tincturæ capsici, ʒj.
Acidi tannici, ʒj.
Infusi rosæ acidi, ℥vj.
Aquæ ad ℥x.
M. f. gargar.

Astringent gargle for relaxed throat

℞ Aluminis, ʒiv.
Acidi tannici, ʒj.
Mellis, ℥j.
Aquæ rosæ ad ℥viij.
M. f. gargar. (*Pressat.*)

Gargle or spray for acute pharyngitis

℞ Acidi carbolici, ʒj.
Cocainæ hydrochloridi, gr. viij.
Glycerini boracis, ʒiv.
Aquæ rosæ ad ℥xij.
M. f. gargar. (or spray).
(*Whitla.*)

Gargle for acute tonsillitis

℞ Phenazoni, ʒij.
Potassii permanganatis, gr. iv.
Aquæ ad ℥xij. (*Semon.*)

Application for chronic pharyngeal catarrh

℞ Iodi puri, gr. iij.
Potassii iodi, gr. xxx.
Glyceriui, ʒv.
M. f. pigmeutum. To be applied to the throat.
(*Schnitzler.*)

Gargle in chronic pharyngitis

℞ Ammonii chloridi puri, ʒjss.
Mellis, ℥j.
Syrupi rosæ, ℥j.
Aquæ ad ℥xiv.
M. f. gargar. (*Bamberger.*)

Gargle for chronic pharyngitis

℞ Glycerini acidi carbolici, ʒiij.
Acidi tannici, ʒij.
Tincturæ capsici, ʒj.
Infusi rosæ acidi ad ℥xij.
M. f. gargar. To be used frequently. (*Whitla.*)

Insufflation for pharyngeal ulcers

℞ Iodoformi, ʒij.
Coffeæ pulveris, ʒij.
M. f. pulv. (*Schnitzler.*)

Antiseptic mouth-wash in pyorrhœa alveolaris

℞ Hydronaphthol, gr. xv.
Alcohol, ℥j.
Water, ℥j.
Thirty drops in a glass of warm water twice daily as a mouth-wash. (*Riesman.*)

Gargle in mercurial salivation

℞ Boracis, ʒij.
Tincturæ myrrhæ, ʒij.
Mellis, ʒiv.
Aquæ rosæ ad ℥viij.
M. f. gargar.
(*Brande.*)

As an antiseptic mouth-wash, in various forms of stomatitis, a solution of peroxide of hydrogen, 2 to 10 per cent., has been found very efficacious in cleausing the buccal cavity. It acts by the liberation of nascent oxygeu.

CHAPTER II

TREATMENT OF DISEASES OF THE ŒSOPHAGUS

ACUTE ŒSOPHAGITIS: Symptoms—*Treatment.*
SPASMODIC STRICTURE, or Œsophagismus: Causes and Symptoms—*Treatment.*
ORGANIC STRICTURE: Causes—Symptoms—*Treatment*—Dilatation—Tubage—Gastrostomy—Note on Rectal and Subcutaneous Feeding.

ACUTE ŒSOPHAGITIS

THIS is a comparatively rare disease except in association with the swallowing of irritant substances such as caustic poisons, or as a result of direct mechanical injury. It may, however, occur as an extension downwards of an acute pharyngitis or upwards of an acute gastritis, but its importance and treatment would be then subordinate to that of the original disease; the same remark applies to its occurrence as an extension of diphtheria, or as a complication of certain acute specific diseases.

The chief **symptom** of acute inflammation of the œsophagus is dysphagia. Pain is felt along the course of the tube, which may be intensified, if ulceration has occurred, at one particular spot. Attempts at swallowing food may be so painful as to excite spasm and the ejection of the food mixed with mucus, and possibly blood, pus, or shreds of membrane. Thirst and feverishness accompany these symptoms.

The **indications for treatment** in this affection are to relieve pain and allay irritation and spasm. Opium must be given to relieve pain, and it may be administered in the form of hypodermic injections of morphine, but if swallowing is at all possible the local contact of a solution of opium with the inflamed mucous membrane is calculated to be very soothing. A solution of cocaine may also be swallowed, if

swallowing is possible, or a combination of cocaine and opium. A teaspoonful of iced fluid containing ¼ grain of extract of opium and ¼ grain of hydrochlorate of cocaine dissolved in it may be placed in the mouth and slowly swallowed, every quarter of an hour, until four to six doses have been taken; or cocaine lozenges may be slowly sucked. Another suitable medicine which may be given, after the preceding, is a mixture of oxychloride of bismuth with tragacanth emulsion and a small quantity of opium; this would afford some sort of protective, soothing covering to the inflamed mucous membrane. Hot fomentations may be applied externally.

Food must be given in the form of nutrient enemata so long as the dysphagia is severe. The thirst may be mitigated by sucking bits of ice, and as soon as a little iced milk or cream can be taken it should be given. A milk diet should be maintained, or a diet composed of wholly unirritating fluids, until all undue sensitiveness or dysphagia has passed away. Olive oil has been recommended, as affording a soothing covering to the inflamed surface, while at the same time functioning as a food.

Stricture of the Œsophagus

Stricture of the œsophagus may be either spasmodic or organic.

1. **Spasmodic stricture, spasm, or œsophagismus.**—Spasmodic contraction of the muscles of the œsophagus arresting the passage of food and drink into the stomach is a neurotic affection, often, but not always, associated with hysteria. We have ourselves observed it most frequently in males, associated with symptoms of the gouty or rheumatic diathesis. Often the exciting cause is hasty eating of indigestible food or drinking too hot or too cold fluids. Sometimes it will occur on attempting to join in a social meal, and the patient is obliged on that account to avoid eating except in private.

The attacks may occur frequently, or long inter-

vals may occur between successive attacks. The attacks sometimes come on quite suddenly and at the beginning of a meal; at other times, after more or less dyspepsia from some error in diet, it occurs on the next attempt to take food. Sometimes the spasm is complete, and neither fluids nor solids can be taken; at other times fluids can be swallowed, but not solids. Sometimes the spasm is only excited by certain kinds of food. Occasionally much flatulent distension of the stomach and abdomen accompanies the attack. Persistent attempts at swallowing are generally attended by forcible rejection of the food, or they may give rise to severe pain. Exploration with a bougie will usually detect the stricture either at the upper or lower end of the gullet, and sometimes at both ends. When at the upper end the bougie can generally, with a little steady pressure, be made to pass through the constriction, but it is often far more difficult to overcome the stricture when at the lower end. In some cases the bougie passes easily. It is well to use a bougie graduated externally, so that the distance from the teeth at which the point of the bougie is arrested may be read off. In the case of hysterical stricture or functional spasm this is apt to vary on successive occasions, while in the case of organic stricture, simple or malignant, the site tends to be constant.

The general nutrition is often greatly disturbed, and such patients have frequently a thin and wasted aspect.

The **treatment** of this affection must be determined, to some extent, by the particular constitutional state of which it is the expression. In purely neurotic or hysterical cases anti-spasmodics and nerve sedatives must be given. The bromide of ammonium in combination with valerian is very useful; asafœtida, camphor, musk, valerianate, oxide of zinc, belladonna, have all been suggested. A cocaine spray is useful when the spasm is limited to the upper part of the gullet. In the intervals cold

douches to the neck and upper part of the spine will improve the nerve-tone and tend to prevent recurrences.

In gouty and dyspeptic cases antacids and saline aperients are useful, and these patients can often be got to swallow a dose of medicine when they reject everything else. Local treatment is of great service, and the systematic passage of the bougie will frequently effect a rapid cure. If there is much hyperæsthesia the tip of the bougie should be dipped in a strong solution of cocaine. It is often desirable to make the patient take food in the presence of the physician; it gives him confidence and overcomes his nervousness. The passage of the bougie, or stomach tube, through which the patient can be fed, should be repeated from time to time until the tendency to spasm has been completely overcome.

The diet, in dyspeptic cases, must be carefully looked to, and those articles of food that have been known to excite spasm should be avoided. Cold fluids are perhaps the commonest exciting cause. The food should be simple, nutritious, and easy of digestion; it should be taken warm; it should be always thoroughly masticated, and eaten slowly and deliberately.

Electrical stimulation of the vagus and counter-irritation along its course or along the spine, as suggested by some physicians, have not appeared to us to be of any real service.

2. **Organic stricture.**—Stricture, or narrowing of the œsophagus, may be caused by any injury which produces loss of substance, ulceration, and subsequent cicatrisation of its coats, as by caustic substances swallowed accidentally or purposely, or by mechanical injury, or wounds in whatever manner inflicted. Stricture of the œsophagus may also arise from syphilis. It is said to arise occasionally from hypertrophy of the muscular and connective tissue, caused by the chronic œsophagitis of spirit drinkers. The presence of morbid growths (cancerous, papillomatous,

or fibroid) in the œsophagus may be the cause of stricture. The œsophagus may also be compressed from tumours arising externally to it, as from enlargement of the thyroid body, or of the cervical or bronchial or mediastinal glands; from cervical or mediastinal abscesses or cancerous or other tumours; from aneurysms; from exostoses.

Stricture may occur in any part of the œsophagus, but is most frequent in the lower third. Above the constriction the walls are thickened and the canal dilated; below it, on the contrary, the walls are usually thinned and the canal collapsed.

The characteristic **symptom** of œsophageal stricture is difficulty in swallowing. When the constriction is only slight this difficulty may not be constant, and may only occur when large masses of solid food are passed into the gullet; small quantities of quite soft food and fluids may pass easily. As the stricture grows narrower difficulty may be experienced in every attempt at swallowing—more, however, at one time than another—but small portions of well-masticated solid food may still be swallowed with no great difficulty if washed down with some fluid. As the disease advances, however, the deglutition of all solids becomes impossible, and only fluids can be swallowed; and finally, in incurable cases, this also may become impossible. Together with dysphagia there is usually regurgitation of the food mixed with frothy mucus, and as the œsophagus often dilates into a pouch of considerable size above the stricture, food may be retained there for some time and regurgitated in a state of decomposition. Food regurgitated from the œsophagus is usually alkaline, unlike that regurgitated from the stomach, which is acid. If the obstruction be cancerous, fragments of the morbid growth, with pus and blood, and brownish and frothy mucus, may also be discharged with the regurgitated food. Great emaciation and obstinate constipation are usually present, and other symptoms may appear, not peculiar to this disease, but dependent on

the special cause which may be giving rise to pressure on adjacent structures. The attempt to pass an œsophageal bougie will demonstrate the existence of the stricture, and its situation and extent.

The **treatment** of stricture of the œsophagus, when of a non-malignant and cicatricial character, consists in attempts at dilatation by the passage of bougies gradually increasing in size. Great care must be used in passing these instruments, until we are assured that the stricture is not due to carcinomatous disease or to external pressure as of aneurysm. In such cases any attempt at the forcible passage of a bougie may be attended by very serious results. **Intermittent dilatation** is the most satisfactory method of procedure. If attempts at mechanical dilatation are well borne, instruments for this purpose may be passed daily, or on alternate days, or at longer intervals, according to the toleration of the patient. The dilating sound, or bougie, should be retained in the canal for a few minutes, and when withdrawn an instrument of still larger size should be introduced for a moment and then removed. This last dilator should, preferably, be hollow like a stomach tube, so that a meal of fluid or semi-fluid food can be given by it, and the œsophagus thus kept quite at rest for some hours. When the canal has been sufficiently dilated to allow of free deglutition, the frequent performance of the operation may be discontinued; but the bougie should still be passed from time to time, every week or so, to ascertain that the dilatation is maintained. The dilatation of the stricture may be assisted by the simultaneous employment of **thiosinamine**, advocated by Hebra as an injection for the removal of scar tissue; half a dram of a 10 per cent. solution in dilute glycerine may be injected subcutaneously into the flank three times a week. Recently **fibrolysin** has been recommended as causing less local irritation and pain than thiosinamine. **Continuous dilatation** has been maintained in some cases by passing and retaining tubes of increasing size in the œsophagus,

until full dilatation is effected; the upper end is secured by a thread fastened to the ear. The distress caused by the continuous presence of the bougie renders this method of little practical value. More risky measures which have been suggested and employed are (1) external œsophagotomy and dilatation of the stricture; (2) gastrotomy and dilatation of the stricture from the stomach; and (3) division of the stricture by internal œsophagotomy.

Iodide of potassium may be given in cases in which a syphilitic origin seems possible.

When the œsophagus is completely occluded by a cicatricial stricture, immediate **gastrostomy** is the only means of saving the patient's life.

In cancerous cases opium will be needed to relieve pain. Small pills composed of opium and creasote or thymol are useful, both for their anæsthetic and antiseptic properties; or hydrochloride of cocaine may take the place of opium if it seems desirable. The following is the formula for these pills :—

℞ Opii extracti (*vel* cocainæ hydrochloridi), gr. iij.
Creasoti, ♏iij (*vel* thymol, gr. vj).
Pulveris saponis, quantum sufficiat

ut fiat massa in pilulas duodecim dividenda. One every hour to relieve pain.

These small pills will probably dissolve in the œsophagus; they may be swallowed with a teaspoonful of iced water.

Cleanliness of the mouth and fauces may be assisted by irrigation with alkaline and antiseptic lotions. Attempts have been made to resolve the stricture by exposure to the **radium tube** passed in a hard rubber capsule screwed into the end of a flexible rubber tube.*

The food in these cases must be adapted to the powers of deglutition or to the capability of a feeding-tube being introduced into the stomach. So long as milk, eggs, and fluid foods can be introduced into the

* Einhorn, *Journ. of the Amer. Med. Assoc.*, July 1, 1905.

stomach, the life of the patient may be sustained in this way. If, owing to difficulty of swallowing, only small amounts of food can be taken at a time, it must be given at frequent intervals, and of as nutritious a kind as possible. It will generally be necessary to have recourse to occasional feeding by the rectum some time before the stricture has become quite impassable; and it has been often noticed that after three or four days of exclusive rectal feeding, together with rest in bed, the patient has been again able to take fluid food by the œsophagus.

During the course of these cases the bowels will require to be relieved by enemata, and it is a good plan to establish early the habit of washing out the bowel daily with a pint or pint and a half of water having a teaspoonful of common salt dissolved in it.

In cases of malignant stricture, when it is no longer possible to swallow even fluid food, either of two resources may be adopted in order to prolong life. These are (1) the method of **tubage** originally suggested by Dr. Krishaber, of Paris, and modified by Mr. Charters J. Symonds, of Guy's Hospital; and (2) **gastrostomy.**

Mr. Symonds' method is to pass through and retain in the stricture a short, funnel-shaped tube, the upper expanded part of which rests on the top of the strictured portion of the canal. It is passed down to the stricture by means of an ordinary conical bougie fitted into the funnel, and after the funnel tube is fixed into the stricture the bougie is withdrawn, a strong silk thread having been previously fastened to the funnel end of the tube long enough to extend beyond the mouth and to be looped over the ear, behind which it is fixed by a piece of strapping. These tubes are made of gum-elastic; they are $6\frac{1}{2}$ inches long, the funnel end is $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter; it ends in an ordinary catheter end and eye. Mr. Symonds maintains that this tube has proved of the greatest service in the treatment of malignant stricture of the œsophagus, upon

which its pressure produces no irritating or injurious effects. It is prevented from slipping down through the stricture by the silk cord attached to it, as well as by the funnel expansion, and by means of the cord it can be easily withdrawn. Its advantages over the long tube projecting from the mouth are obvious; it is not unsightly, it does not interfere with deglutition in any way, it does not irritate the larynx, and it does not cause a constant escape of saliva from the mouth. In the first case reported by Mr. Symonds the patient was kept alive for eight months in comparative comfort, and never felt any inconvenience from the tubes; the stricture dilated considerably, and on post-mortem examination no injurious effect could be traced to its pressure. In the latter stages of the disease it was necessary to remove the tube frequently, as it became blocked with sputum and food. Life has been prolonged for periods varying from four to eleven months by the use of these tubes. The tubes do not usually require changing oftener than every three or four weeks; No. 12 or 14 is the size usually worn. They are durable, and the same tube and silk have been used for more than three months. Mr. Symonds appears to think that the use of these tubes will generally obviate the necessity of having recourse to gastrostomy, with its attendant dangers, and the distress caused by excoriation of the skin around the external orifice of the gastric fistula.

It is only, then, in cases in which the application of tubage seems quite impracticable that the operation of **gastrostomy** should be resorted to. It should also be always borne in mind that although when first admitted into the hospital a patient may be quite unable to swallow, yet that after a day or two's rest in bed and the administration of nutrient enemata with opium the power of swallowing will often be to some extent restored.

Many cases have been reported of malignant stricture of the œsophagus in which gastrostomy

appears to have prolonged life, in a state of comparative comfort, for considerable periods, during the whole of which time no food has been taken except through an artificial opening in the stomach. It is no doubt best, when gastrostomy is the only means available to relieve the patient's distress and to prevent him from dying of starvation—a fate which absolutely stares him in the face—that the operation be done before the patient's strength and endurance are exhausted.

Note on feeding by the rectum.—We shall have so frequently to recur to the subject of rectal feeding, that this seems the best place to offer a few remarks on that subject. Though a useful temporary expedient, tradition has assigned to the procedure a value far higher than it actually possesses. The most reliable modern investigations have shown that, under the most favourable conditions, it is only possible to supply, by means of enemata, about one-quarter of the food-material required to maintain nutritive equilibrium. Seeing, therefore, that the intestine absorbs different foods with very different readiness, it is important, if we are to use rectal feeding to the greatest advantage, to have a clear idea of the faculty of absorption of the various proximate principles of food. Protein, even when peptonised, is so badly absorbed as to be of comparatively little value: the same is generally true of fat, even when emulsified, but different individuals vary widely in their power of fat-absorption. Sugar is well absorbed, but the actual absorption has probably been somewhat overrated, as sufficient allowance has not been made for the destructive activity of bacteria, breaking up sugar, so that some at least is lost for purposes of nutrition. The same is probably true in a less degree of proteins. Water and salts are well absorbed; so also is alcohol. Common salt seems to favour the absorption of proteins. By the most careful adjustment it is difficult to raise fat-absorption above 10 grammes

in twenty-four hours, or that of protein above 20 grammes.

It must be admitted that, though rectal feeding is almost always an ineffectual substitute for mouth feeding, exceptional cases do occur in which patients appear to thrive and maintain nutrition unimpaired for long periods of time. It has been suggested that this is due to some of the injection finding its way beyond the ileo-cæcal valve, and so undergoing fuller digestion and absorption in the small intestine. If this be so, it affords some indication of a means by which we may hope to obtain greater benefits from rectal feeding. It is proved to demonstration that such anti-peristaltic movements do occur in the intestine, and assist reflux of fluids, but we fancy this must be an exceptional occurrence, and that the true explanation lies in some exceptional peculiarity of absorption.

Daremberg, in a case of stricture of the œsophagus, kept a patient alive for fourteen months, and with a daily excretion of urea amounting to from 225 to 300 grains, by means of peptonised enemata made in the following manner: Into a glass or other suitable vessel introduce 7,500 grains of meat as lean as possible, minced fine; pour on this about 100 ounces of pure water and an ounce of hydrochloric acid of a density of 1·15. To this add 40 grains of the purest and best pepsine. Digest this mixture for four hours at a temperature of 112° F. Then pour it into a vessel of porcelain and let it boil, adding meanwhile a solution of bicarbonate of soda (17 grains to the ounce) until the mixture has a slight alkaline reaction; this will require 5 to 6 ounces of the solution. Strain the liquid through fine linen and express the insoluble residue; then concentrate the whole in a *bain marie* to 50 or 60 ounces. Half this is given by the rectum daily.

Ewald maintains, in opposition to the generally accepted opinion, that artificial predigestion is not necessary to ensure the absorption of nutrient enemata.

Catillon kept a dog alive in good condition for thirty-seven days by rectal injections consisting of two daily lavements, each composed of three eggs and a dram and a half of liquid glycerine of pepsine; without the pepsine the dog wasted rapidly, and when this was replaced by fluid blood he rapidly sank. In view, however, of the results obtained by Pasteur with simple enemata of warm water it is impossible to draw from this observation any conclusion as to the value of peptonisation. Pasteur claims, as a result of repeated trials, that warm water is as efficient as any of the nutritive compounds for rectal feeding. He begins with a 5- or 6-ounce enema and gradually increases the volume by an ounce at a time to 10 ounces. The enemata are given every four to six hours. This method of feeding may be kept up without any supplementary nourishment for ten days to three weeks, and the patient show no serious symptoms of inanition. The method has, in any case, the merit of simplicity and ease of administration, while the relatively large amount of fluid given prevents the troublesome access of thirst. Patients for whom rectal feeding is required are usually in urgent need of water, either on account of vomiting or hæmorrhage or from some other cause, and in the first few days of rectal feeding there may be actual gain of weight from absorption of water and salts. In weighing the relative advantages of nutrient enemata and simple warm water injections we must not underestimate the value of psychical factors, which Pawlow has shown to exert so important an influence on the processes of digestion and absorption. The sensation of hunger may be actually relieved by the administration of a nutritive enema.

Mutch and Ryffel* consider that a 6 per cent. solution of dextrose in tap water, which is isotonic with blood, is preferable to saline solution. They give 15 ounces or more four times a day.

* *Lancet*, Jan. 18, 1913.

We may mention some suitable forms of nutrient enema. The following is Boyd and Robertson's formula :—

Yolks of two eggs.
30 grammes of pure dextrose.
0·5 gramme of common salt.
Pancreatised milk to 300 c.c.

This should be given every six hours.

Dextrin has been suggested as a substitute for dextrose, on the grounds that it is less irritating to the bowel and less liable to destructive decomposition by bacterial activity.

Bamberger suggests the following :—

20 grammes of somatose.
20 grammes of dextrose.
1 gramme of common salt.
200 c.c. of water.

Alcohol may be added to either of these formulæ.

Nutrient enemata should be given warm, about 98° to 100° F.

Dujardin-Beaumetz advised the following: The yolk of an egg is beaten up with a glass of milk, and to this are added either two dessertspoonfuls of solid peptones or two tablespoonfuls of liquid peptones, 5 drops of laudanum, and, if the peptones are acid, 7 or 8 grains of bicarbonate of soda. The secretion of the large intestine is alkaline, and acids irritate it, and in cases where prolonged alimentation by the rectum is necessary, all irritation of its mucous membrane must be carefully avoided. Peptonisation for nutrient enemata may be carried on for a much longer time than when the peptonised material is to be given by the mouth, as the taste is a matter of no moment. It may be maintained for as long as one hour at a temperature of 140° F. But if the choice is open, pancreatic predigestion is preferable to peptic digestion. The following is a useful formula, and is easily prepared: Beat up 2 eggs with 4 ounces of warm milk, add a dessertspoonful of liquor pancreaticus, 20 grains of sodium bicarbonate, and 30

grains of common salt. A tablespoonful of brandy and some sugar may be added before administration. Somatose and sanatogen are favourite additions to nutrient enemata.

Another good nutritive enema may be prepared with the yolks of 2 eggs, half a teaspoonful of common salt, a teaspoonful of arrowroot first carefully mixed with an ounce of warm water, a dessertspoonful of brandy, and 4 ounces of warm pancreatised milk.

No reliance should be placed on nutrient suppositories; we have known instances in which the large intestine has been found crammed with them on post-mortem examination.

During a course of rectal feeding the bowel should be washed out once daily with an enema of tepid water, before the nutrient injections are given. This precaution is necessary, not only for the clearance of the bowel, but also to prevent auto-intoxication from absorption of the poisonous products of albuminous decomposition. We have seen profound toxic anæmia arise from the inadequate performance of this daily ablution.

Nutrient enemata should be given from a funnel attached to a tube about 10 or 12 inches long, which in turn is connected with a No. 8 gum-elastic catheter. This should be warmed and oiled before insertion. It should be gently introduced and passed up as high as possible. The patient should be, preferably, on his left side, with his hips raised on a pillow, and the injection should be allowed to flow in very slowly. The posture is important in bringing the fluid into contact with as large an extent of absorbing surface as possible. The more slowly the injection is given, the more likely is it to be retained; the smallest can hardly be given satisfactorily in less than 15 to 20 minutes, and larger ones may require as much as three-quarters of an hour. The patient should lie as quietly as possible for an hour after each injection, and, if there is any difficulty of

retention, it is advisable to compress the anus for 10 or 12 minutes with a warm towel, or to raise the foot of the bed some 8 or 10 inches. In cases of extreme irritability of the rectum it may be necessary to prepare the patient for the enema by the use of a cocaine or morphine suppository, which can then be followed usually by a relatively large enema. This is in our opinion preferable to the addition of laudanum to the injections. Sometimes this irritability is traceable to the solid residue of the previous enema lying in the rectum. In this case a small plain water injection should be administered and discharged, before attempting to give the nutrient enema.

The appropriate size of each injection will necessarily vary with individual patients. To avoid troublesome thirst not less than 2 pints of fluid should be allowed in twenty-four hours to an average adult patient. If this total amount is to be given in enemata at intervals of six hours, each enema should consist of 10 ounces. This amount can usually be retained, if it is administered slowly. As a matter of experience, it will be found that the best-retained enema is habitually that which follows the early washing out of the bowels; and if this is thoroughly performed, so that no decomposing material is left to irritate the bowel, there will seldom occur any difficulty in retaining the 10-ounce enema. Large enemata have the advantage of less disturbance of the patient, diffusion over a wider surface of bowel, and less liability to excoriation of the anus from frequent introduction of the catheter. If smaller amounts are inevitable, we must either increase the frequency of administration, or give supplementary enemata of plain warm water.

In any case of rectal feeding we shall be compelled to employ additional means of keeping the mouth moist and clean. Perhaps the most satisfactory method is to rinse the mouth at intervals with some simple antiseptic solution. An agreeable mouth-wash will be found in 5 or 6 drops of odol in 2 ounces of

water, or half a dram of listerine in a similar dilution. Over and above the cleansing of the mouth, these antiseptic washes may help to stave off the inflammation of the parotid gland, which is apt to occur when no draught is made on its salivary secretion. Sucking small pieces of ice is by no means an infallible remedy for thirst and dryness of the mouth; in some patients it seems to aggravate the condition, and there is the added objection that a large amount of water necessarily finds its way into the stomach and excites movement. Acid drops and effervescing lozenges will be found of little or no value.

Exceptionally, rectal feeding has been known to excite vomiting, but by what means is uncertain; in such cases it will be necessary to resort to cautious administration of fluids by the mouth.

Attempts have been made to supplement rectal by **subcutaneous feeding.** Sterilised solutions of dextrose have been given; but as dextrose is so readily absorbed by the bowel, the advantage is not manifest. Barker claims good results from the administration of a pint of 5 per cent. solution of glucose for the relief of exhaustion after surgical operations. Stronger solutions cannot be used, and the nutritive value of weak solutions is too low to be of much practical utility. Sterilised olive oil, an ounce twice a day, has also been tried, but as yet there is little evidence of beneficial effect, owing partly to the extreme slowness of its absorption.

In spite of abundant laboratory experiments with blood-serum, alkali-albumin, albumoses and peptones, we have so far learnt only that proteins are capable of exciting serious toxic symptoms during circulation and excretion.

CHAPTER III

TREATMENT OF DISEASES OF THE STOMACH: ACUTE AND CHRONIC GASTRIC CATARRH

ACUTE GASTRITIS, OR ACUTE GASTRIC CATARRH: Causes—Symptoms — *Treatment* — Lavage—Emetics — Purgatives—Rest—Careful Diet—Ice-bag—Counter-irritation—Opiates and Sedatives—Alkaline Effervescents —Calomel—Care in Convalescence.

CHRONIC GASTRIC CATARRH: Causation—Symptoms— *Treatment* —Lavage—Emetics—Purgative and other Mineral Waters—Anti-fermeutives — Bismuth — Object and Use of Alkalis—Iron in Anæmic Cases — Hydrochloric Acid and Pepsin—Aperients—Dietetic Management.

Additional Formulæ.

ACUTE GASTRIC CATARRH*

THIS disease has also been termed "inflammatory dyspepsia," and it *is* a form of dyspepsia inasmuch as it usually arises in connection with some difficulty in the process of stomach digestion. One of the most common predisposing causes of acute gastric catarrh is a disordered secretion of gastric juice, which is either deficient in quantity or defective in quality; hence arises abnormal decomposition of the ingesta, owing to their undue detention in the stomach, and thus is set up irritative inflammation of the mucous membrane. Such a condition usually accompanies febrile maladies, and it also occurs in feeble and debilitated anæmic states; and so it happens that quite slight errors in diet will prove sufficient to excite an acute gastric catarrh in convalescents from exhausting diseases, and in the weak and anæmic. Ewald says, "A convalescent patient gets acute gastric catarrh

* We do not propose to consider the treatment of cases caused by irritant poisons, mineral or vegetable, as that subject pertains to Toxicology. The special indications in acute toxic gastritis are to get rid of or to neutralise the poison, to combat collapse, and to allay the inflammatiou or heal the ulceration of the damaged stomach.

from a beefsteak which the same man manages easily when he is well."

Persons who have suffered from malarial affections, and gouty and rheumatic persons, are also predisposed to attacks of this disease. The exciting cause of attacks of acute gastric catarrh is commonly to be found in some error in diet. The food may simply be excessive in quantity, so that the gastric juice secreted is not sufficient to digest the whole of it, and the undigested residue undergoes abnormal decomposition within the stomach; or the food may be of coarse and indigestible quality, and the gastric mucous membrane may, at the same time, be constitutionally sensitive and irritable; or the food may be difficult of digestion on account of imperfect mastication, so that the gastric juice cannot penetrate it; or the same may be the case from the food being soaked with fat or rich sauces. Or the articles of food and drink may be in themselves irritating, from being too hot or too cold, or too pungent, or in a state of decomposition; and the products of albuminous decomposition act as powerful irritants to the stomach. The stronger alcoholic beverages are especially prone to set up gastric catarrh; too long use of certain medicines; catching cold and surface chills in certain persons; the painful emotions, anxiety, fear, anger, etc., possibly by disturbing secretion: all these seem to be capable of exciting catarrh of the stomach.

The continued and habitual use of narcotics, such as opium, by diminishing both the secreting and the propelling force of the stomach, may lead to retention and abnormal decomposition of the ingesta, and so excite gastritis.

In certain cases of blood contamination in infective and other diseases it is probable that toxalbumins may be excreted by the stomach and then exert a direct irritant action on the gastric mucous membrane.

Acute gastric catarrh may, of course, also occur

as a consequence of other gastric diseases, simple or malignant.

The foregoing are the **causes** we shall chiefly have to bear in mind in considering the appropriate treatment of cases of acute gastric catarrh.

The **symptoms** which usually accompany this disease are the following: A sense of fullness and uneasiness in the stomach, with flatulent distension and tenderness on pressure over the epigastrium. A coated tongue, foul breath, a bad taste in the mouth, thirst, loss of appetite, increased flow of saliva, nausea, and "heart-burn," accompanied by eructations of sour, acrid, fœtid substances resulting from the morbid decomposition of food in the stomach. In severe cases there is much epigastric pain with vomiting, the vomited matters consisting of altered food, mucus, bile, and occasionally streaks of blood. If the catarrh of the mucous membrane extends to the duodenum there may be some icteric discoloration of the skin from involvement of the orifice of the common bile-duct. Sometimes there is constipation; at other times, when the catarrhal condition extends to the small intestine, there is diarrhœa and abdominal tenderness. The urine is scanty and high-coloured, and deposits urates. In addition to the local symptoms there are usually general malaise and bodily and mental depression, severe frontal headache, coldness of the extremities, and often patches of herpes on the lips. To severe cases of this kind, with some rise of temperature and a quick pulse, the term "gastric fever" has often been applied. The depression and other nervous symptoms observed in connection with this malady may be due to the absorption of poisonous substances generated within the alimentary canal.

The **indications for treatment** in acute gastric catarrh are the following:—

1. To remove from the stomach any irritating substances that may be retained there.

2. To rest the inflamed stomach as completely as possible.
3. To administer only fluid, unirritating, and easily absorbed food, in small quantities at a time.
4. To apply such direct remedies as will relieve the pain, hyperæmia, and irritation of the gastric mucous membrane, prevent morbid decomposition of the ingesta, and correct excessive acidity when it exists.
5. To enforce the observance of sound dietetic rules, during and after convalescence, so as to guard against a return of this malady.

1. When it is evident that the gastric catarrh is excited or maintained by the presence of decomposing food in the stomach, means must be taken to remove it. In cases where there is obvious dilatation of the stomach, as well as acute catarrh, it will probably be best, by means of the stomach tube,* to empty and then to wash out the stomach with some warm, weak alkaline solution, so as to detach and carry away any sticky, ropy mucus which may be adhering to the mucous membrane. Ems or Vichy water, or a weak solution of bicarbonate of soda (3 grains to the ounce), will do for this purpose. When there are objections to, or difficulties in, the application of this method, it may be useful to give an emetic, especially in the case of young children and persons who vomit easily. From 5 to 20 grains of powdered ipecacuanha, according to age, in from 1 to 4 tablespoonfuls of warm water, will act well with most persons, and with care in the subsequent treatment it will rarely be necessary to repeat this. Some prefer to administer a hypodermic injection of $\frac{1}{24}$ to $\frac{1}{12}$ grain of apomorphine, but it must be borne in mind that this drug is very depressing to some persons. Rather than these emetics we ourselves prefer giving large draughts of warm water, and, if this is not vomited, to

* *See* the chapter on Dilatation of the Stomach, p. 127 *et seq.*

promote vomiting by tickling the fauces with a feather, so that the water may be rejected, and the irritant contents of the stomach thus washed away. In other cases we may succeed in emptying the stomach by means of mild purgatives, together with gentle manipulation or massage of the stomach; the pressure on the distended organ being directed from left to right, i.e. from the cardiac towards the pyloric end. By mild measures of this kind, together with complete abstinence from solid food, we may be enabled to empty the stomach of its contents in a manner perhaps more agreeable to the patient than by either of the preceding ways. A suitable aperient for children is the compound rhubarb powder, 10 to 20 grains, and for adults 1 or 2 drams of Carlsbad salts dissolved in warm water, twice a day. When we have succeeded in cleansing the stomach from all irritating contents we have

2. To enforce rest of the inflamed organ. In severe cases the entire exclusion of all food from the stomach for two or three days will be of great service. Nutrient enemata should be administered, the patient should be kept in bed, and allowed simply to sip iced water or to suck small fragments of ice. If there should be any craving for food, or any restlessness or pain, a morphine suppository, or the addition of a few drops of tincture of opium to each enema, will usually relieve these symptoms.

When such complete abstinence is not indicated, or is impracticable, then we must limit the food to bland nutritious fluids, given cold, and in small quantities at a time, such as a few spoonfuls every hour of equal parts of milk and lime-water iced, or milk and Vichy water, or one or two tablespoonfuls of thin water arrowroot three or four times a day.

A strict diet of this kind will, when the patient is kept at rest in bed, suffice for a few days, and the stomach will be thus maintained almost in a state of complete physiological rest

3. The third indication is practically a continuation of the second, and directs us to exercise the greatest caution in regulating the diet while the acute condition is passing away, giving only the lightest kinds of food in small quantity at a time, and if necessary in a predigested form.

4. The fourth indication applies especially to medicinal treatment. It is rarely necessary to abstract blood locally by applying leeches (two or three) to the epigastrium, as has been suggested; this measure may, however, be found useful occasionally in febrile cases with much local pain and irritability. A poultice should be applied after the leeches have been removed. The application of cold compresses or of the ice-bag to the epigastrium is a favourite remedy with some physicians. This measure, together with sucking small fragments of ice, is often efficacious in arresting vomiting, while it also relieves thirst. A mustard poultice to the epigastrium is sometimes useful and more agreeable to patients than the ice-bag. Pain must be relieved by opiates, or by a combination of opium and hydrocyanic acid, together with bismuth, which is an excellent gastric sedative. When the pain is acute a hypodermic injection of morphine, $\frac{1}{6}$ or $\frac{1}{4}$ grain, will be attended by immediate relief, and this is the best way of administering a narcotic in cases where the stomach still contains irritating substances. But when the stomach is known to be free from irritating contents, the irritation attending the inflammation of the mucous membrane is, perhaps, better allayed by giving opium by the stomach. The following is a suitable prescription for adults:—

℞ Bismuthi salicylatis (*vel* oxychloridi) ...	gr. xxx.
Extracti opii	gr. ij.
Acidi hydrocyanici diluti	♏xviij.
Sodii bicarbonatis	℥j.
Mucilaginis tragacanthæ	℥j.
Aquæ	ad ℥vj.

Misce, fiat mistura. Two tablespoonfuls every three or four hours.

When there is a great tendency to vomiting (without much local pain), and distressing thirst, effervescing drinks are often very useful and grateful to the patient. The following may be prescribed :—

℞ Sodii bicarbonatis ... ... ʒiij.
Aquæ laurocerasi ... ... ʒiv.
Aquæ ... ... ad ℥viij.
Misce, fiat mistura.

℞ Acidi tartarici ... ... ʒij.
Divide in pulveres octo. A powder to be dissolved in a tablespoonful of water, and added to two tablespoonfuls of the mixture, and taken while effervescing, every hour or two.

The eructations of gas which follow the introduction into the stomach of such alkaline effervescent fluids are useful in bringing away other deleterious gases which may have collected there. The excess of alkali is also useful in neutralising the contents of the stomach when acid, and in loosening and detaching tough ropy mucus which may have accumulated on its surface. Indeed, if the patient complains of sour eructations, we should give the alkaline carbonates freely to relieve this symptom.

Persistent hiccough may necessitate emptying of the stomach, either by lavage, or by drinking large draughts of warm water. When the stomach is emptied, small doses of liquor bismuthi with bromides or diluted hydrocyanic acid will be useful.

We must be cautious how we attempt to arrest the diarrhœa which occasionally accompanies such cases as we are considering. This is often a conservative measure, and carries away offending substances, and by unloading the tributaries of the portal vein it tends to reduce the hyperæmia of the gastric mucous membrane. Indeed, some physicians have recommended that it should be encouraged or induced by the administration of ipecacuanha and calomel. Ewald is "a great advocate" of calomel in these cases.* A few grains of calomel may be

* "Lectures on Diseases of the Stomach," vol. ii., p. 501, Sydenham Society's translation.

mixed with a little sugar of milk and placed dry on the tongue, and followed by 2 or 3 ounces of fluid magnesia or Apenta water. Some prefer castor oil, half an ounce or more, with 10 drops of laudanum. In convalescence it is often desirable to augment the activity of the gastric secretion by giving 6 or 8 grains of pepsin with each meal of animal food. Those cases of acute gastric catarrh which can be directly traced to the effects of *chill* should be treated by diaphoretics, rest in bed for a few days, and restriction of the diet to unirritating fluid foods. Those who are subject to such gastric chills will be well advised to wear habitually a flannel belt next the skin, and woollen socks or stockings summer and winter.

5. Finally, there is the last important indication, which is directed to the avoidance of those errors in diet which may have originally provoked the malady. After recovery we should insist that only easily digested food be taken, in moderate quantity and at sufficient intervals; that the food be eaten slowly and thoroughly masticated. All excess of alcoholic stimulants, all rich entrées, all pastry, and all substances calculated to set up fermentation in the stomach, should be strictly forbidden. Any tendency to constipation must be overcome by regular exercise, suitable food, and an occasional aloetic pill or saline aperient.

Chronic Gastric Catarrh

Chronic catarrhal inflammation of the mucous membrane of the stomach is frequently a sequel of one or more attacks of acute gastritis, and its causation must in such cases be referred to those influences which produce the acute affection. The chronic form of gastric catarrh is, however, especially prone to follow the abuse of tobacco and of alcoholic beverages, and particularly the use of ardent spirits and acid wines; it is often due to the habitual indulgence in excess of food, or in articles of diet of a pungent, indigestible, exciting, and irritating

character, or to the abuse of drugs. Briefly, errors in diet, long continued, are the chief causes of chronic gastric catarrh, which Ewald describes as "the best-fostered and most widespread of this world's ills." Those persons, also, who in their occupations are compelled to "taste" things, as wine "tasters," tea "tasters," and cooks, are subject to this disease. Persons who eat too rapidly, or, on account of defective teeth, masticate their food imperfectly; those who drink too much at meals, and so overdilute the gastric juice; those who eat pastry made with rancid fat, or who take large quantities of sugar, are apt to suffer from chronic gastric catarrh. The insoluble starches and cellulose also play an important part in exciting catarrh. Feeble, anæmic, and chlorotic patients, with weak digestive powers owing to defective secretion of gastric juice, which is either deficient in quantity or defective in quality, and in whom the digestion of food is thereby retarded and the ingesta are detained so long in the stomach as to undergo morbid decomposition—these also are subject to chronic gastritis.

It accompanies certain chronic diseases, such as phthisis and those disorders which are attended with obstruction in the portal system, as hepatic cirrhosis, or those chronic structural changes in the heart and lungs which lead to dilatation of the right side of the heart and obstruction to the outflow from the inferior vena cava and the hepatic veins. All these morbid states cause passive hyperæmia of the gastric mucous membrane, and so induce chronic gastric catarrh. It occurs also in those diseases in which excretion is defective, as in gout and renal affections.

The **symptoms** which accompany chronic gastric catarrh resemble in many respects those of simple functional dyspepsia; but in the cases we are now considering these symptoms often depend upon structural alterations in the mucous membrane of the stomach —induration from proliferation of interstitial tissue, and degeneration from fatty change in the cells of

the gastric tubules. The patient complains of loss of appetite, of a sense of weight, fullness, or even pain in the region of the epigastrium, increased by taking food. He has flatulent and acid eructations, accompanied by a sensation of heat or burning, extending from the stomach along the œsophagus to the pharynx, and commonly known as "heart-burn."

He often suffers from nausea, and occasionally from vomiting. The vomited or eructated matters are highly acid, and have been found to contain acetic and butyric, as well as lactic acids, and other abnormal products of morbid fermentation, including sarcinæ and torulæ.

In the chronic gastric catarrh of the alcoholic there is usually a morning vomit of watery fluid mixed with mucus, to which the term "pyrosis" or "water-brash" is applied. This consists chiefly of saliva swallowed during the night mixed with gastric mucus, the secretion of saliva in this complaint being often greatly increased. There is often considerable flatulent distension of the small intestine, due to the presence of food undergoing abnormal putrefactive changes, and, although there is generally obstinate constipation, there may be occasionally diarrhœa from coexisting intestinal catarrh. If the catarrhal condition extends to the duodenum and affects the common bile-ducts the symptoms of jaundice may appear. The mouth is often foul, and the tongue dirty and flabby and indented by the teeth at its edges. This, however, is not always the case, and the tongue is not infrequently small, red, and pointed.

The urine usually deposits urates, as well as crystals of oxalate of lime, and occasionally it is phosphatic. The nervous system usually suffers considerably in well-marked cases. There is great mental as well as physical dullness and lassitude, great depression of spirits, accompanied with much irritability of temper, frequent headache, and now and then distressing attacks of vertigo. These nervous symptoms have been referred to the probable

absorption of toxins, the products of imperfect digestion. The cardiac rhythm is occasionally disturbed, and the heart's action becomes rapid and irregular. The general nutrition usually suffers considerably, especially in cases of long duration, as absorption from the mucous membrane of the stomach is interfered with by the presence of a layer of tough mucus on its surface, so that the patient emaciates and loses strength.

An examination of the gastric contents after a test-breakfast (Ewald's) may show diminished acidity, from deficiency of hydrochloric acid; at other times the acid is increased. The two ferments, pepsin and rennet, are present; achroödextrin and sugar are abundant, but erythrodextrin is present only in small amount. Much mucus may be found in the contents of the stomach in some patients, but in others it may be absent. When the stomach is washed out in the morning, fasting, the water returned from the stomach usually contains much mucus.

In the **treatment** of chronic gastric catarrh the first indication is to remove, if possible, the exciting cause of the catarrh. When it is due—as it so often is—to the abuse of alcohol, abstinence from alcoholic drinks must be insisted upon. When it is a consequence of those organic diseases of the liver, lungs, or heart which lead to secondary engorgement of the mucous membrane of the stomach, the treatment which is beneficial to those diseases will be also remedial of the catarrh of the stomach. When it has been induced by obvious errors in diet, these must be corrected. When it is a consequence of debility and anæmia, tonics and blood restoratives must constitute part of the treatment. When it is associated with some incurable organic disease of the stomach itself, or has advanced to the condition of senile atrophy, palliative measures alone are possible. If the condition of the teeth is defective, these must be set in order. Too little attention is apt to be paid to the hygiene of the mouth in gastric

catarrh, in spite of the obvious evidence of local decomposition in the state of the tongue. The teeth should be well brushed and the mouth washed with some antiseptic—equal parts of listerine and water are as good as any—after each meal.

Besides attending to the preceding indications for treatment, it is also necessary that we should adopt measures for arresting the morbid fermentations going on in the stomach, and for relieving the stomach of all decomposing substances and cleaning its mucous surface of the layer of tough, ropy, tenacious mucus which usually covers it and blocks, as it were, the orifices of the secreting tubules. Other indications are to relieve excessive acidity of the gastric contents when it exists, to allay existing irritation of its mucous membrane, and to preserve it from further irritation by great care in the choice of food and by enforcing such dietetic measures as shall ensure to the stomach as much functional rest as is possible.

Let us now consider how the above indications may be best carried out in detail.

In aggravated cases where we have evidence of the retention of decomposing matters in the stomach, one of the most efficacious measures is to begin by emptying the stomach mechanically of its contents by means of the stomach pump or siphon tube, and at the same time **washing out** the stomach* in the morning, fasting, with some weak warm alkaline solution; for this purpose we may use warm Vichy water, or warm water containing 2 or 3 grains of sodium bicarbonate and 5 or 6 grains of common salt to the ounce, or a weak solution of borax, 3 or 4 grains to the ounce. Boas recommends a 1 per cent. salt solution, with 4 or 5 tablespoonfuls of lime water to each litre. By this measure we shall not only effectually remove the irritating results of the abnormal fermentation of the food, but we shall also

* The technique of this method is described in the chapter on the treatment of Dilatation of the Stomach (p. 127 *et seq.*).

cleanse the mucous membrane of the stomach of the viscid mucus which adheres to it.

When the patient positively refuses to submit to mechanical treatment of this kind, or where we encounter difficulties in carrying it out, other methods of emptying and cleansing the stomach may be adopted. An initial **emetic** of ipecacuanha or of apomorphine, or of warm water, as mentioned on page 52, may be administered; or a better process, in many cases, is to carry away the contents of the stomach through the intestinal canal and wash its surface at the same time by the prolonged and systematic administration of **purgative waters**, and especially of mineral waters like those of Carlsbad, Tarasp, and Marienbad, which contain the alkaline sodium bicarbonate as well as the purgative sodium sulphate. The alkaline carbonate neutralises the excessive acidity of the stomach contents, while the aperient sulphate sweeps them away through the intestinal canal without setting up any irritation of the intestinal mucous membrane. These waters must be given in the morning, fasting, in sufficient quantity to cause several watery stools; in this way the stomach is daily washed and cleansed of all lingering decomposing food and adhesive mucus.

Whenever practicable this treatment is best carried out at **Carlsbad** itself, where the strict diet enforced greatly contributes to the cure; but the same rules and method may be enforced and carried out at home.

After a time, or when it is clear that a decided aperient action is not needed, but the object is simply to cleanse the mucous membrane of the stomach of the morbid, viscid, catarrhal mucus with which it is covered, then the simple alkaline sodium bicarbonate waters, such as warm Vichy, Ems, or Vals water, or simple hot water containing 2 or 3 grains each of sodium bicarbonate and of common salt to the ounce, may be used instead of the Carlsbad water. Two or three tumblerfuls should be drunk in the morning, fasting, and no food should be taken till an hour

after the last glass. "The results from this treatment," says Niemeyer, "are the most brilliant that are ever attained in medicine."

In some chronic, obstinate cases in neurotic, sensitive subjects, in which the symptoms are not very severe, but rather annoying and troublesome from their persistence, the gaseous chloride of sodium waters of Kissingen often prove most efficacious, and appear to agree better than the stronger aperient waters. Ewald considers the chloride of sodium waters are indicated in the cases of chronic gastric catarrh with depressed glandular secretion.

If we use a simple bicarbonate of soda water, it will often be an advantage, especially in gouty subjects, to order a tumblerful, as hot as can be drunk comfortably, to be taken half an hour or an hour before lunch and dinner and at bedtime; the object being to wash away all residual mucus or other substances remaining from the previous meal before another is taken, and also to neutralise any excess of acid which may remain in the stomach, and to stimulate a healthy secretion of gastric juice.

Other measures may at the same time be taken to check or arrest fermentive action in the stomach; two of the best remedies for this purpose are creasote and thymol or menthol, given in pills immediately after food. The latter may be prescribed in this form :—

℞ Thymol or menthol ... ... gr. j.
Pulveris saponis ... ... gr. ij.
Spiritus vini rectificati, quantum sufficiat
ut fiat pilula. To be taken twice or three times a day, immediately after food.

The following is a good form for giving creasote :—

℞ Creasoti ... ... mss.
Pulveris rhei ... ... } āā gr. jss.
Pulveris calumbæ ... ... }
Pulveris saponis ... ... gr. ss.
Misce, fiat pilula. To be taken twice or three times a day, after food.

In some irritative states of the stomach, with pain and nausea after food, or when there is pyrosis, the

preparations of **bismuth**—the subnitrate, the carbonate, and the oxychloride—are very useful. These preparations of bismuth not only act as antiseptics and antacids, but they exert a useful astringent effect on the relaxed and engorged mucous membrane, and probably act also mechanically by affording a sort of protective covering to the irritated mucous surface. It is often advantageous to combine the bismuth with an alkali, especially when there is complaint of "heart-burn" together with acid eructations.

The following is a usual prescription :—

℞ Bismuthi subnitratis ... ... gr. xv.
Magnesiæ ponderosæ ... ... } āā gr. v.
Sodii bicarbonatis ... ... }
In a cachet. Three times a day.

Or it may be prescribed in a mixture as follows :—

℞ Bismuthi carbonatis ... ... gr. xv.
Magnesiæ ponderosæ ... ... } āā gr. v.
Sodii bicarbonatis ... ... }
Mucilaginis tragacanthæ ... ... ℥j.
Aquæ menthæ piperitæ ... ... ad ℨj.
Misce, fiat haustus. To be taken half an hour before food three times a day.

An excellent combination for the purpose of relieving the pain and nausea which so often accompany aggravated conditions of this malady is the following :—

℞ Bismuthi carbonatis ... ... gr. x.
Acidi hydrocyanici diluti ... ... ♏v.
Liquoris opii sedativi ... ... ♏v.
Mucilaginis tragacanthæ ... ... ℥j.
Aquæ menthæ piperitæ ... ... ad ℨj.
Misce, fiat haustus. To be taken half an hour before food or when in pain.

A grain of carbolic acid or a few drops of glycerine of carbolic acid may be added to each dose.

In advanced cases in which there is much irritability of the gastric mucous membrane, and pain after taking food, benefit may also often be derived from the administration of argentic nitrate in combination

with small doses of opium. Given in a pill in doses of $\frac{1}{4}$ to $\frac{1}{2}$ grain, combined with $\frac{1}{2}$ grain of extract of opium, half an hour before each meal, it will often have a valuable sedative effect.

Some authors recommend an intragastric spray (1 in 1,000) of this salt, or to wash out the stomach with a 1-in-2,000 solution, in cases of hyperacidity.

In cases where we find much localised tenderness in the epigastrium the repeated application of small blisters has been found very serviceable.

In mild cases a cure may often be effected by careful regulation and limitation of food, and by the judicious use of alkalis combined with vegetable bitters such as quassia, calumba, gentian, nux vomica, etc. The alkalis neutralise the morbid acidity of the stomach contents, the bitters appear to stimulate appetite and give tone to the stomach, and both appear to promote the secretion of healthy gastric juice. They should be given about half an hour or an hour before a meal. The following prescription is a useful one:—

℞ Sodii bicarbonatis ... ... gr. xv.
Tincturæ nucis vomicæ ... ... ♏v.
Infusi calumbæ ... ... ℥j.
Misce, fiat haustus. To be taken three times a day, an hour before food.

In cases of persistent loss of appetite, a teaspoonful of fluid extract of condurango in a wineglassful of water before meals will be found beneficial.

It is important to understand thoroughly the object and right use of **alkalis** in the treatment of this disease. They are useful and necessary for the purpose of neutralising the acids, such as acetic and butyric, which result from the morbid fermentation of certain articles of food in the stomach, but they must not be given so as to neutralise the natural acid of the gastric juice. They are therefore best given at the end of the digestive process, and within a short distance of the next meal. At this time they answer other useful purposes; given in dilute solution

warm, they dissolve and wash away, as we have already pointed out, the sticky morbid catarrhal mucus adhering to the gastric mucous membrane. But it is also not infrequently necessary to give alkalis in many troublesome cases of chronic gastric catarrh, even during the digestive process, to relieve the suffering that is often caused by the rapid and excessive morbid development of acids in the stomach. We should, however, give them with caution and in not too large doses, and it is best then to combine an insoluble with a soluble alkali, for the former will only dissolve in an acid medium, and so soon as the offending acid is neutralised it will remain practically inert. A dose of 10 grains of sodium bicarbonate with 10 grains of light magnesia in an ounce of peppermint water is a good form for this purpose.

In anæmic cases, in which the gastric catarrh is due to an imperfect blood supply and defective secretion of gastric juice, it is often best to give a tonic containing iron and a few drops of dilute hydrochloric acid to restore the due proportion of acid in the gastric juice, soon after each meal. The following is a good form :—

℞ Ferri et quininæ citratis ... ... gr. v.
Liquoris strychninæ ... ... ♏iij.
Acidi hydrochlorici diluti ... ... ♏x.
Aquæ ... ... ad ℥j.

Misce, fiat haustus. To be taken after food, three times a day.

In such cases it may also be necessary to give a dose of pepsin at or immediately after meals.

In advanced atrophic cases, in which from wasting of the gastric glands there is a great deficiency of digestive secretions, and sometimes an almost entire absence of hydrochloric acid and pepsin in the stomach, the indication is to administer full doses of this acid, with pepsin, after taking food. Ewald, who seems scarcely sufficiently to appreciate the value of alkalis in many cases of this disease, is, on the other hand, a vigorous advocate of the free use

of hydrochloric acid. "It not only," he says, "replaces the deficient secretion of the glands, and forms the necessary acid albuminates for peptonisation, but it prevents organic fermentations, or limits those already existing." He gives it "in as concentrated watery solution as possible; that is, as acid as the patient's mouth will stand, three or four times, every quarter of an hour, after eating," and continues this treatment "for months without any bad effect." Pepsin he only gives "in advanced cases of mucous catarrh and atrophy of the stomach," and then in large doses, 7 to 15 grains dissolved in hydrochloric acid and water, about fifteen to twenty minutes after meals.* We regret that we cannot fully share Prof. Ewald's views as to the great advantages to be realised from these large doses of hydrochloric acid.

In this country, at any rate (and it would appear to be so also in France, judging from the writings of French physicians), it is far more common to find the subjects of chronic gastric catarrh to be suffering from hyperacidity.

In cases that are not being treated by purgative waters, the tendency to constipation must be corrected, and the bowels kept freely open by some suitable aperient. A pill of 1 to 3 grains of extract of aloes with half a grain or a grain of ipecacuanha powder, or 5 grains of the compound pill of colocynth and henbane, should be given at bedtime, and occasionally a grain of calomel or 2 grains of blue pill may advantageously be added. Some authorities think highly of the use of small doses of calomel in protracted cases of chronic gastric catarrh. Cascara, or the compound rhubarb pill, or an infusion of senna pods, may all be advantageously employed at times. Plethoric subjects, who are also troubled with a torpid condition of the bowels, will derive much benefit from an annual visit to Marienbad.

In cases that appear to have been brought on by chill a Turkish bath may be useful, together with

* "Lectures on Diseases of the Stomach," vol. ii., p. 38.

cold affusion and friction of the surface; a flannel belt worn round the abdomen has been found an excellent preventive, especially in malarious districts. The action of the skin should also be promoted by the habitual use of warm clothing.

Persons of indolent, sedentary habits should be encouraged to take adequate exercise in the open air as an essential part of the treatment; and, on the other hand, excessively energetic and restless patients should be made to understand that a due amount of rest is often an important curative agent when the body is feeble and ill-nourished. The overworked town-dweller will need freedom from work and a spell of fresh country air.

Intragastric faradisation has been applied in some of these cases, and is commended by some American authorities on gastric diseases;* but we have never found it needful to recommend its application, although it might doubtless be of use in the neurotic forms, for these patients are never so happy as when they are being submitted to much elaborate manipulation.

Finally, we have to consider the **dietetic** management of these cases, which, it need scarcely be said, is of the first importance. It must be borne in mind that our first object is to give the stomach as much functional rest as possible, and we must therefore give the minimum amount of food consistent with the due maintenance of the nutrition of the body, and we must give it in the most easily assimilable form. In very severe cases it may be desirable to give the stomach absolute rest for a time, and it may be necessary to support the patient for a few days exclusively by nutrient enemata, allowing only a little iced water by the mouth or iced Vichy water to allay thirst and neutralise acidity. In such cases it is necessary, of course, to confine the patient to bed.

* The method of applying this is described in Max Einhorn's "Diseases of the Stomach," p. 144.

Restriction to an exclusively milk diet has been strongly advocated in this malady, and it certainly proves of the greatest value in certain severe cases, allowing, as it does, a considerable amount of functional repose to the stomach, and moderating the acidity and irritating character of the gastric secretions, especially when we dilute the milk, as is often absolutely necessary, with an equal quantity of Vichy or Apollinaris water. We must, however, watch for individual idiosyncrasies with regard to this diet, as some patients digest milk with great difficulty. We must not give large quantities at a time; 3 ounces of milk with 3 ounces of an alkaline water every two hours will be enough at first: the amount of milk must be steadily increased, and, if practicable, without increase of the alkaline diluent. The constipation which is apt to attend such a diet should be corrected by a dose of Carlsbad salts—two or three teaspoonfuls in a tumblerful of hot water the first thing in the morning. We have rarely found this diet well supported unless the patient is, at the same time, kept absolutely at rest. Buttermilk, in which the casein is already curdled and finely divided, agrees with some persons better than fresh milk, and has been warmly advocated by some German physicians. Eggs, whipped up in warm milk, are well borne by most patients.

Carbohydrates, except in very small quantities, are generally best avoided in cases of stomach catarrh with hyperacidity and flatulence; they tend to undergo acetous and butyric fermentation, and often greatly increase the morbid acidity of the gastric contents. A little thin crisp toast is better than bread. Sometimes vegetables must be withheld entirely: but as a rule small quantities of fresh vegetables and potato may be permitted in the form of purées. Many patients can eat with impunity a soft stewed Spanish onion; plain boiled tomatoes and vegetable marrow seldom cause any trouble. Highly sweetened food and jams must be avoided.

The reduction of carbohydrates is particularly indicated when flatulence is a prominent symptom.

Fats and fat sauces must be taken sparingly, as they tend to the formation of fatty acids in the stomach, and, by rendering the food more or less impermeable to the gastric juice, retard digestion. Butter, however, is not infrequently an exception to this rule. It is often of use, as soon as the patient is thought able to take solid food, to give a teaspoonful of glycerine of pepsin or of Benger's liquor pepticus with each meat meal. Great regard should be paid to individual peculiarities. Niemeyer has pointed out that certain dyspeptics digest salt and smoked meats better than fresh ones, and accounts for this by the circumstance that those preserved meats are less readily decomposed than fresh meat.

The meals of these patients must be small in quantity, not bulky, and, as their digestive processes are often very slow, ample time must be allowed between the meals. The best and tenderest portions of the lean of meat, chicken, game, and the lightest kind of fish should be selected; and if the teeth are defective, and mastication, in consequence, is imperfect, it is necessary to give these in a finely-divided form.

With regard to beverages, it is advisable to forbid alcohol altogether, as well as strong tea or coffee. If a little wine seems to be needed, a light Bordeaux or Rhine wine of good quality mixed with Apollinaris water is the best. The plan of giving some alkaline water, warm, half an hour before food, such as Vichy, Vals, or Ems water, not only has the advantage of cleansing the mucous membrane of the stomach, as we have already explained, but it also tends to lessen the desire to drink while eating.

We cannot insist too strongly that in the treatment of chronic gastric catarrh no rules are absolute: each patient has his or her own peculiarities; but the following may be taken as a suitable diet in average cases at the commencement of treatment—

admitting of modifications in accordance with the preceding general remarks:—

8 A.M., *Breakfast.*—One or two poached or lightly boiled eggs: 2 oz. of thin toast; ½ oz. of butter; a cup of China tea (infused 3 minutes) with one-third milk.

11 A.M.—A cup of consommé or bovril or other meat juice.

1 to 1.30, *Lunch.*—3 oz. of tender lean of meat or chicken (not pork or veal); 2 oz. of mashed potato or purée of spinach; 1 oz. of thin dry toast; ¼ oz. of butter.

4 to 5 P.M.—A cup of China tea, as at breakfast; one or two slices of thin (stale) bread and butter.

7 P.M., *Dinner.*—A grilled or boiled sole or whiting, about 4 oz.; or a grilled mutton cutlet (free from fat), about 3 oz.; or breast or wing of chicken or pheasant, with 2 oz. of mashed potato, and a plain custard pudding.

A tablespoonful of brandy (good quality) with 4 oz. of water may be taken at lunch and at dinner.

(This diet will, of course, need increasing as gastric tone is restored.)

ADDITIONAL FORMULÆ

In acute gastric catarrh in infants with nausea and vomiting

℞ Acidi tartarici, gr. xv.
Aquæ laurocerasi, ♏x ad xx.
Syrupi mori, ʒij.
Aquæ destillatæ ad ℥v.
M. f. mist. A dessertspoonful every two hours.
(*Prof. Monti.*)

If with fever

℞ Acidi hydrochlorici diluti, ♏v ad x.
Syrupi simplicis, ʒij.
Aquæ destillatæ ad ℥iij.
M. f. mist. A dessertspoonful every two hours. (*Monti.*)

Powders for chronic gastritis

℞ Bismuthi subnitratis, ʒxij.
Bismuthi subgallatis, ʒiv.
M. et divide in pulv. xxiv. One powder in a wafer four times daily. (*Hemmeter.*)

For chronic gastric catarrh with pyrosis

℞ Bismuthi subnitratis, gr. lxxx.
Morphinæ hydrochloridi, gr. ¾.
Sodii bicarbonatis, gr. xxx.
M. et divide in pulv. x. A powder to be taken every two hours. (*Bamberger.*)

Do. with loss of appetite

℞ Extracti gentianæ, gr. xxx.
Syrupi aurantii corticis, ʒv.
Aquæ destillatæ ad ℥vj.
M. f. mist. A tablespoonful before each meal. (*Bamberger.*)

Or

℞ Tincturæ nucis vomicæ, ♏xxx.
Aquæ laurocerasi, ʒijss.
Tincturæ quassiæ ad ℥j.
M. f. mist. Fifteen drops to be taken, in water, three times a day. (*Bamberger.*)

When gastric irritability has disappeared, but feverishness continues

℞ Quininæ hydrochloridi, gr. v.
Acidi hydrochlorici diluti, ♏v.
Syrupi simplicis, ʒjss.
Aquæ destillatæ ad ʒiij.
M. f. mist. A teaspoonful every two hours. (*Monti.*)

For acute gastric catarrh

℞ Acidi carbolici, gr. ½.
Bismuthi subnitratis, gr. x.
Mucilaginis acaciæ, ʒss.
Aquæ menthæ piperitæ ad ʒij.
M. To be taken in a tablespoonful of water every one, two, or three hours.
(*D. D. Stewart.*)

In acute gastric catarrh in children

℞ Bismuthi carbonatis,
Sodii bicarbonatis, āā gr. ij.
Pulveris rhei, gr. ss.
Pulveris aromatici, gr. j.
M. f. pulv. To be taken before each meal.

For chronic gastric catarrh

℞ Argenti nitratis, gr. vj.
Bismuthi subnitratis, gr. xxx.
Extracti hyoscyami, gr. xl.
M. et divide in pil. xl. One morning and evening. (*Millet.*)

Sedative mixture in acute gastric catarrh

℞ Bismuthi carbonatis, ʒv.
Acidi hydrocyanici diluti, ʒj.
Liquoris morphinæ hydrochloridi, ʒij.
Mucilaginis acaciæ, ʒjss.
Aquæ chloroformi ad ʒiv.
M. f. mist. A teaspoonful four times a day before food.
(*Whitla.*)

For chronic gastric catarrh in children

℞ Sodii bicarbonatis, ʒj.
Creasoti puri, guttæ iv.
Pulveris acaciæ, q.s.
Glycerini, ʒij.
Olei cinnamomi, guttas iv.
Aquæ puræ ad ʒiij.
M. f. mist. For a child of six, a small teaspoonful in a little water, soon after meals.
(*Prof. Pepper.*)

For anorexia in chronic gastritis

℞ Strychninæ sulphatis, g. ⅓.
Acidi hydrochlorici diluti, ʒv.
Elixir gentianæ ad ʒvj.
M. f. mist. A tablespoonful in a wineglass of water, after meals. (*Hemmeter.*)

CHAPTER IV

TREATMENT OF DISEASES OF THE STOMACH: GASTRIC AND DUODENAL ULCER, AND GASTRIC CANCER

ULCER OF THE STOMACH AND DUODENUM: Characters—Causation—Symptoms and Course—Pain—Vomiting—Hæmorrhage—*Treatment*—Washing out the Stomach—Alimentation—The "Rest" Cure—Drugs, etc.—Normal Horse-serum—Transfusion—Treatment of Perforation—Gastro-enterostomy—After-treatment.

CANCER OF THE STOMACH: Situation—Diagnosis—Symptoms—*Treatment*—Diet—Washing out the Stomach—Anti-fermentive and Antiseptic Remedies, etc.—Condurango Bark—Operative (Surgical) Treatment.

Additional Formulæ.

ULCER OF THE STOMACH AND DUODENUM

THE disease the treatment of which we are now about to consider has been variously named "simple," "round," and "peptic" ulcer of the stomach and duodenum. Duodenal ulcers are found in the part of the duodenum above the bile papilla. It is important to distinguish clearly between the *acute* and the *chronic* type of ulcer. Acute ulcers are often multiple, and are found in any part of the stomach. The edges are clean punched out and show no thickening. The base is smooth or may be covered with an adherent slough. There is a special tendency to perforation. When healing takes place, cicatrisation is very slight. The chronic ulcer is usually single, and nearly always at the pyloric end of the stomach. The edges are terraced, so that the ulcer presents a conical shape, and thickened. The base is rough and firm. There is little tendency to perforation, and when it does occur it is often confined by adhesions. The cicatrisation of a chronic ulcer of the stomach often leads to great contraction and deformity. Duodenal ulcers very frequently present the characters

of the acute ulcer. When cicatrisation occurs extensively in connection with large or multiple ulcers of the stomach extending transversely from the lesser curvature, it may cause hour-glass contraction by drawing up the greater curvature towards the lesser; or if situated near the pylorus, it may produce pyloric stenosis and consequent dilatation of the stomach.

The chief dangers attending this form of ulcer are perforation and hæmorrhage. If the ulcer perforates all the coats of the stomach or duodenum before inflammatory adhesion has taken place between it and one or other of the adjacent organs, peritonitis, often fatal, is rapidly set up; if one of the larger blood-vessels becomes eroded, great and fatal hæmorrhage may result; smaller hæmorrhages are of common occurrence, as we shall see, in the course of the chronic forms of this disease. Owing to the greater mobility of the anterior wall and greater curvature, ulcers in these situations are attended with greater danger of perforation. Relapses are frequent even after cicatrisation, as the cicatricial tissue, it must be remembered, is of low organisation.

Very little is known with certainty as to the **cause** of this affection, and very little help therefore in framing indications for treatment can be derived from etiological considerations.

Gastric ulcer is, in our experience, more common in women than in men, and anæmic and debilitated conditions seem to predispose to its occurrence. Duodenal ulcer, on the other hand, is more common in men. It is said that in women the tendency to perforation is especially marked about the age of twenty. Gastric ulcer has been observed to be of frequent occurrence in cooks, who have to taste hot things, and in tipplers. We must, however, admit a very varied causation. The general conclusion arrived at in many cases is that some local affection of the vessels of the mucous membrane at the seat of ulceration is attended by thrombosis

and obliteration of the vessels of a small vascular area, with consequent necrosis of the corresponding mucous surface—that this is attacked and dissolved by the gastric juice, and perhaps a condition of *hyperacidity* of this secretion may determine the solution of the subjacent tissues and the rapid formation or deepening of the ulcer. The peculiar characters of the peptic ulcer are no doubt due to the acidity of the gastric contents and the constant movement in the process of digestion. Bacterial agency is believed by some to be an important factor by causing local necrosis: so too is the action of a toxic serum. Bolton has produced gastric ulceration by injection of the serum of an animal which had been immunised by repeated injections of the gastric cells of another animal. Fenwick refers it to inflammatory necrosis of solitary follicles, which are peculiarly abundant at the pyloric end of the stomach. He has been able to demonstrate in some cases the situation of an ulcer at the site of a lymphoid follicle. However, as already stated, the etiology of simple gastric ulcer is admittedly obscure. It is, however, a well-established fact that chlorosis in young women predisposes to gastric ulcer. Duodenal ulcer seems to depend on the same causes as gastric ulcer, but a few cases are curiously related to burns, and perhaps are due to the elimination of toxic products in the bile.

The **symptoms** of this affection must next be examined in detail. The three most important are—(*a*) pain; (*b*) vomiting; (*c*) hæmorrhage.

(*a*) The pain of gastric ulcer usually comes on directly after taking food, but it may be delayed for half an hour or longer. It is commonly localised in a circumscribed spot in the epigastrium. Paroxysms of more diffused pain are also common, spreading over the whole epigastric region and extending through to the lower dorsal or interscapular region. Coarse, indigestible, hot, and pungent foods are especially prone to excite this pain. It usually continues as

long as food remains in the stomach, and is relieved when the contents of the stomach are discharged by vomiting. The pain is generally increased by pressure, and there is almost always some tenderness on pressure over a circumscribed spot in the epigastrium even when the stomach is empty. When the tenderness on pressure is exceedingly severe, it is regarded as a sign of the occurrence of peritonitis around the seat of the ulcer. The pain of gastric ulcer is sometimes radiated to more distant nerves—the lower intercostal, other branches of the vagus, etc.—and pains may arise from cicatricial adhesions to other organs and the involvement of nerve fibres in these cicatrices; and it must be borne in mind that such pains may continue after the healing of the ulcer.

The pain following the taking of food is regarded as caused by the movements then excited in the stomach irritating the surface of the ulcer, and this is further aggravated by contact with the acid gastric juice secreted on the introduction of food. There is often a complaint of more or less continuous dull aching pain in the epigastric region in the intervals of digestion. It is important to bear in mind that in some latent and obscure cases severe pain is wholly absent, and fatal perforation or serious hæmorrhage may occur suddenly and unexpectedly, the only preceding symptom being a little uneasiness during digestion. Exceptionally cases are met with in which pain is relieved by ingestion of food. This is probably due to the food fixing the irritant acid of the gastric juice.

In duodenal ulcer the pain is located in the right hypochondrium, and is apt to be delayed for an hour or two after food, when the acid chyme begins to find its way into the duodenum.

(*b*) Vomiting is rarely absent in cases of gastric ulcer. It usually occurs, as the pain does, shortly after taking food; it is ordinarily preceded and accompanied by pain, which the vomiting, when complete, relieves. The vomited matters consist of

food more or less changed, mixed with mucus and acid secretions in which sarcinæ may often be found. An abnormal amount of hydrochloric acid is often present in the matters vomited; and Max Einhorn* states that the acidity may reach as much as three or four times that of normal gastric juice. It has been noticed that the vomit in gastric ulcer rarely contains bile. The vomiting is provoked by irritation of the nerve-fibres in the ulcerated surface and by the frequent coexistence of gastric catarrh, and it is especially excited by improper and irritating food. Its effect is to exhaust the patient by the continuous withdrawal of nourishment, unless it be checked by treatment.

(*c*) Hæmorrhage. — Probably in all cases of gastric ulcer some bleeding takes place into the stomach from the surface of the ulcer, but a small hæmorrhage into the stomach need not lead to vomiting; it would, however, probably reveal itself in an altered colour of the stools if these were watched, or by one or other of the tests for occult bleeding. But when there is frequent vomiting in cases of gastric ulcer, the vomited matters usually at some time or other contain blood. The vomit is often of a dirty brown colour, due to the action of the gastric juice on the hæmoglobin. It has been estimated that a considerable hæmorrhage occurs in about one-third of the cases; some authorities (Lebert) consider that it occurs in a far greater proportion. It is absent, as a rule, in the acute perforating cases.

The hæmorrhage may vary considerably in amount, from a little oozing, just sufficient to discolour the vomit, to large gushes of blood seriously imperilling the life of the patient, and sometimes sufficient at once to cause fatal syncope. Death, however, directly due to hæmorrhage is very rare. The occurrence of profuse hæmorrhage shows that the ulceration has extended deep enough to reach and erode the larger

* "Diseases of the Stomach" (2nd edit.), p. 211.

vessels. In such cases the blood vomited is often pure and of a bright colour, not having remained long enough in the stomach to be altered by contact with the gastric juice. All the blood that thus escapes is not, of course, vomited, but much passes away through the intestinal canal, giving rise to what are termed "tarry" stools; and in rapidly fatal cases there may be no escape of blood by the mouth, as it may immediately over-distend the stomach and remain there. The hæmorrhages tend to recur frequently, as the movements of the stomach—and especially those induced by the ingestion of food—lead to the re-opening of the bleeding vessels. These repeated losses of blood either induce a profound anæmia or lead ultimately to death by exhaustion. In duodenal ulcer, melæna without hæmatemesis is the rule.

In addition to these three prominent symptoms, most sufferers from peptic ulcer present the more common symptoms of the dyspeptic state, as a condition of chronic gastric catarrh often accompanies ulceration of the stomach. Cases, however, occur in which no symptoms of dyspepsia are complained of. But usually there are loss of appetite, heartburn, and acid* eructations, nausea, a sense of weight and oppression in the epigastrium, thirst, bad taste in the mouth, and the usual symptoms of chronic gastric catarrh. In advanced cases, owing to impairment of the movements of the stomach by adhesion to other organs, or by contraction of parts owing to extensive cicatrisations, dilatation of the stomach may be developed, with retention and decomposition of food.

Constipation is a usual accompaniment of gastric

* Ewald, Reigel, Hemmeter, and others state that the gastric juice withdrawn from the stomach in cases of simple ulcer is, almost always, more *acid* than in health; but Fenwick remarks that "while hyperacidity is an important cause of the *chronicity* of an ulcer, the *disease itself is usually the cause and not the consequence of the hypersecretion*, since any form of local irritation in the stomach is sufficient to induce a reflex secretion of the gastric juice."—("Ulcer of Stomach," p. 90.)

ulcer; this is chiefly due to the small amount of food digested, the greater part being rejected by vomiting. Dreschfeld has noted the occurrence of acetonuria in certain cases of gastric ulcer.* This condition, however, is not uncommonly encountered in the course of rectal feeding.

A condition of general debility with great depression of spirits is usually induced by chronic ulcer of the stomach, but we meet with exceptional cases in young women who remain fairly plump and well nourished.

Amenorrhœa is a symptom also commonly met with in this disease.

It has been calculated that perforation into the general peritoneal cavity occurs in about 7 per cent. of all cases of ulcer of the stomach;† it occurs twice or three times more frequently in the female than the male, and in the former especially between the ages of 14 and 30. It is important to bear in mind, from the point of view of treatment, that the immediate cause of perforation of gastric ulcer is often the existence of some condition producing tension of the stomach walls, such as distension with food or gas, retching and vomiting, straining at stool, coughing, sneezing, violent exertion or sudden movement of the body, and mechanical pressure on the epigastrium. Perforation of a gastric ulcer is reported to have occurred from kneading the abdomen to relieve flatulence in a patient in a hydropathic establishment,‡ from the passage of a bougie (Fenwick), and from the performance of lavage (Ewald).

The symptoms of perforation are—first, severe and agonising pain in the epigastrium, which spreads all over the abdomen. This is accompanied with symptoms of collapse, a small, quick, thready pulse;

* Article on Ulcer of Stomach, in Allbutt and Rolleston's "System of Medicine," vol. iii., p 469.

† Fenwick, "Ulcer of the Stomach and Duodenum," p. 200.

‡ Dalton, *Trans.* of the New York Pathological Society, vol. i., p. 263.

face pale and pinched; skin covered with cold, clammy perspiration; voice feeble, respirations shallow, quickened and thoracic. The temperature is at first subnormal, but rises if the patient survives for a time and peritonitis ensues. The tongue gets dry, there are thirst and often much retching, although no vomiting. There is marked constipation. The secretion of urine is diminished and may be suppressed.

The abdomen is usually distended and tympanitic; the liver dullness may be absent or much diminished. If the patient does not die at once from collapse, the temperature rises to 102° or 103° F. from peritonitis, the pulse gets harder, respiration more shallow, hiccough occurs, and death commonly follows from exhaustion.

Peptic ulcer in the majority of cases is completely curable; it must, nevertheless, be remembered that cicatrisation of an extensive ulcerated surface of the gastric mucous membrane and subsequent contraction of this cicatrix, or adhesions between the stomach and surrounding organs, may lead to troublesome symptoms later on, such as gastralgia, vomiting, and other symptoms of dyspepsia; or contraction of the pyloric end of the stomach or of the duodenum may cause dilatation and its consequences, as has already been pointed out.

The **indications for treatment** are the same both in gastric and in duodenal ulceration. If, as some suggest, we are to accord a leading part to bacterial agency in the causation of peptic ulcer, all conditions of oral sepsis should be carefully avoided. The teeth should receive regular attention, so that no carious cavities may form a nidus for the growth of virulent microbes; pyorrhœa should on no account be neglected. It will be well to use habitually an antiseptic tooth-powder, and to wash out the mouth night and morning with some antiseptic lotion. All other septic discharges that may be swallowed into the stomach must be dealt with without delay.

The great and paramount indication in the

treatment of gastric ulcer is to promote healing and cicatrisation of the ulcerated surface. This will be best effected by such means as will remove all sources of irritation, and secure the greatest amount of **rest,** mechanical and functional, to the stomach; the avoidance of irritating movements being an important condition of the healing process. The patient must, therefore, for a time at any rate, be kept at rest in bed, not even rising for micturition or defæcation, and the stomach must be kept as empty as possible, since the presence of food excites movements in it. By keeping the stomach empty we also avoid the irritating contact of food and gastric juice with the ulcerated surface; and the gastric mucous membrane being thrown into folds, in the contracted state of the stomach, the tension on the ulcerated surface is thereby relaxed and its healing promoted. Before treating any gastric ulcer we should try to decide whether it is of acute or chronic type, as the former is very amenable to medical treatment, the latter very resistant.

An appropriate **method of feeding** is, then, the most important part of the treatment of such cases. Medicinal remedies may also be of value (*a*) by producing a protective covering to the ulcerated surface, and so preventing the contact of irritating substances with it; (*b*) by *arresting hæmorrhage;* and (*c*) by *relieving pain.*

As to the practice of **washing out the stomach,** which has been advocated by some physicians, in this disease, we agree with Sée, Leube, and Ewald that it is not unattended with danger of severe and fatal hæmorrhage, and that it is not to be commended. It is also inconsistent with the idea of keeping the stomach at rest. In certain very chronic cases, accompanied with chronic catarrh and dilatation of the stomach, and the protracted retention and decomposition of food in that organ, cautious and careful washing out, using a soft rubber tube and adopting the siphon process, may possibly be useful. But

when there is any risk of exciting hæmorrhage, this method must be strictly avoided.

As to the mode of alimentation best calculated to promote mechanical and functional rest of the stomach, and so contribute to the speedy healing of the ulcerated mucous membrane, we have formulated rules for this purpose which may be thus summarised.

In all cases of gastric ulcer, and more especially where severe and dangerous hæmorrhages * have occurred and may recur, and in all cases of intractable vomiting, it is necessary to keep the stomach absolutely at rest and empty. For five or six days at least the patient should be fed exclusively by the bowel. Nutrient enemata† are open to the objection that they have been shown to excite free gastric secretion, and so prevent complete rest of the stomach. For this reason some prefer to employ simple enemata of warm water, 10 to 15 ounces, every six hours, if it is felt that the small amount of nutriment to be derived from nutrient enemata may be dispensed with. To allay thirst the mouth may be frequently washed out with a solution of 5 or 6 drops of odol in 2 ounces of water. Sucking fragments of ice is seldom desirable: it may actually increase thirst, and it always excites peristaltic movements. Enemata of normal saline solution have been given, in addition to the nutrients (Ewald), to relieve intolerable thirst. As we have already pointed out, complete rest in bed must be enforced. This alone is often sufficient to check pain and vomiting, and to ensure the formation of a firm coagulum in the mouth of any bleeding vessel.

After five or six days of rectal feeding, some fluid food, in small quantities at a time (not more than 1 or 2 ounces), may be given by the mouth every three or four hours. Rectal feeding should be stopped as soon as possible, as at best it is semi-starvation, and inasmuch as depressed health is an

* *See* section on Hæmatemesis, p. 137 *et seq.*
† *See* **Rectal Feeding, pp. 42-48.**

important predisponent to peptic ulcer, it is hardly likely that it greatly promotes healing. When all immediate risk of further hæmorrhage appears to have ceased, feeding by the stomach may be carried out on the following principles: (*a*) All food that can either mechanically or chemically irritate the surface of the ulcer must be avoided. (*b*) Food that is calculated to stimulate the acid secretions of the stomach must be forbidden, as these act as irritants to the ulcerated surface; predigested foods, or foods that will pass rapidly through the stomach and be digested in the small intestine, are indicated. (*c*) We must be especially careful to avoid distending the stomach by giving any great quantity of food at a time, for, as we have already said, by maintaining the stomach in a contracted condition its mucous membrane is thrown into folds, the margins of the ulcer are relaxed, and its superficial extent thereby diminished—circumstances which favour the filling up and cicatrisation of the ulcer. The quantity of fluid or semi-fluid food should therefore be limited to between 2 and 4 ounces at a time. As a rule, restriction to an exclusively milk diet will fulfil these indications. It is essential, however, that we should obviate the possible danger of the formation of a considerable mass of milk curd in the stomach by taking measures to prevent any firm coagulation of the casein of milk in that organ. The milk should in all cases be diluted with an alkaline water, and pure undiluted milk should never be given except in convalescent cases and in persons who have been found to digest milk with facility. The milk may be diluted with an equal quantity of lime water or Vichy water, or to each cup of milk and water a powder may be added composed of

Bicarbonate of soda	10 grains.
Light magnesia	5 ,,

Four ounces of milk and water thus treated may be given every two hours. If there is difficulty

in digesting the diluted milk, it may be warmed and peptonised instead. Simple boiling will do much to diminish the size of the curd, and aid its removal from the stomach. Buttermilk is sometimes a useful temporary expedient. If there is a tendency to bleeding, a small amount of gelatin may be added to the milk. As far as possible food should be given at about body temperature. If we desire to give the patient more concentrated or more supporting food, an egg may be beaten up with two tablespoonfuls of boiling water, and then strained through muslin, and to this 2 ounces of milk and water may be added; or about an ounce of the crumb of a stale roll, well soaked previously in hot water and rubbed through a sieve, may be mixed with 3 ounces of milk and water, and given twice or three times a day. It is especially important also not to give food too frequently, even fluid food, lest it should accumulate in and over-distend the stomach: for this reason, and so as not to interfere with sleep, a considerable interval from food should be allowed at night.

In cases where we encounter a distinct intolerance of a milk diet, and milk, in any form, instead of allaying seems to promote vomiting, we may at first substitute albumin water made from the whites of fresh eggs, small feeds of chicken or veal broth, Brand's essence or Valentine's meat juice, and water arrowroot sweetened to taste.*

Leube's soluble meat is much used in Germany in cases like these. This preparation is usually mixed with slightly salted broth and taken lukewarm; some milk and some well-soaked bread may be added.

Dreschfeld speaks highly of scraped raw beef as well borne, if given in small quantities. He gives it

* The lean of meat (raw) passed twice through an American mincer, and then cooked for twelve minutes in a *bain marie* with a little water, will be found a useful food in these and many other circumstances. One or two teaspoonfuls of the meat may be mixed with a tablespoonful or two of clear soup.

early in the course of the case.* It is impracticable on an exclusively milk diet to give a patient with gastric ulcer all the milk required to maintain full nutritive equilibrium, so that the sooner some such additions can be made the better. Cream, simple farinaceous food, and peptones can usually be introduced into the diet at an early stage.

All wine and spirits should be forbidden. A little weak tea with milk may be permitted, but not more than three-fourths of a small teacupful at a time. If oatmeal gruel is given (and it may be advantageously mixed with milk) it should be prepared with finely-powdered oatmeal, and not with coarse groats, the rough particles of which are apt, by their contact, to set up irritation of the ulcerated surface. Peptonised foods, especially milk and gruel, are distinctly valuable.

Rest in bed, we repeat, is a most important condition in the graver cases, as it not only avoids movement of the injured organ, but lessens the nutritive wants of the system as much as possible. In less serious or in convalescent cases, although a certain limited amount of gentle exercise may be permitted, the advisability of physical rest must still be kept in mind.

When there is reason to believe that cicatrisation has been established, a cautious and gradual return to ordinary diet may be permitted, care being observed that the food is of a kind easy of digestion. Eggs, scraped or pounded meats, sweetbreads, Benger's food, Allenburys' Diet, cornflour blancmange, and milk puddings may be given as a preliminary to a more solid dietary. To ensure permanent healing, care in diet must be maintained in some degree over a period of several months.

In chronic cases, associated with much chronic catarrh of the stomach, the advantage of clearing out and cleansing the stomach and alimentary canal by

* Article on Ulcer of Stomach, in Allbutt and Rolleston's "System of Medicine," vol. iii., p. 486.

repeated draughts of Carlsbad water or a solution of Carlsbad salts* in hot water has been urged by many authorities. The sodium sulphate in these salts, by stimulating peristaltic action, promotes the expulsion of the contents of the stomach into the small intestine; the sodium bicarbonate dissolves stringy and tenacious mucus, and also aids in its detachment and expulsion from the stomach, while it acts also usefully as an antacid; the sodium chloride is a stimulant to digestion and an antiseptic. The object in view is the same as that aimed at by *lavage*, the danger of which it avoids, viz. the regular removal of the decomposing and irritating stomach contents from contact with the ulcerated mucous membrane.

The following is the best way of carrying out this treatment: A teaspoonful of the Carlsbad salts is dissolved in 6 ounces of warm water (100° to 120° F.), and four such doses are taken at intervals of ten or fifteen minutes, in the morning, fasting. Breakfast must not be taken until half an hour after the last dose. After breakfast the patient usually has two or three loose actions of the bowels. If the bowels are too freely acted upon, a somewhat smaller quantity of the salts should be added to each glass of water; and if not sufficiently relieved, the quantity of the salts, but not of the water, must be augmented. If for any reason the bowels cannot be kept open by laxatives administered by the mouth a copious simple enema should be administered daily.

The "rest cure" adopted by some German physicians in the treatment of gastric ulcer differs little from the foregoing. It requires the patient to remain in bed for two or three weeks, during which time warm linseed poultices are applied to the epigastrium. If there has been much pain or vomiting, feeding by the rectum is practised for two or

* Artificial Carlsbad salts are best made by combining sodium sulphate, sodium bicarbonate, and sodium chloride, in the proportion of 8 ounces of the first, 1 ounce of the second, and ½ ounce of the third.

three days, and only a few fragments of ice are taken by the mouth. For the first fortnight the diet is restricted to milk absolutely, diluted usually with barley or oatmeal water. The milk is slightly warmed and slowly sipped, about 3 ounces being given every hour. In the third week bread and milk, milk puddings, and poached eggs are permitted, the patient being fed at intervals of two hours. In the fourth week some pounded raw or slightly grilled meat is given once or twice a day. If the patient's progress is satisfactory a gradual return to a solid dietary, composed chiefly of white fish, game, sweetbreads, potatoes, and broths, is permitted. Some authorities consider that strict dietetic treatment should be maintained for a year or eighteen months, especially in long-standing chronic cases; in that case, for from three to six months milk must form the staple diet, but after the second month some solids may be added, as bread and milk, lightly boiled eggs, scraped or pounded raw meat, etc., and between the sixth and twelfth or eighteenth month a gradual return to ordinary diet may be permitted by the progressive introduction of the more easily digested kinds of fish, game, poultry, etc.

Lenhartz's method of treating gastric ulcer requires separate mention. He keeps the patient at complete rest in bed for four weeks. For the first fortnight an ice-bag is applied continuously to the stomach to prevent gaseous distension, to obviate hæmorrhage, and to relieve pain. On the first day, even if there has been recent hæmorrhage, 7 to 10 ounces of iced milk are given in spoonfuls, and 2 to 4 eggs, beaten up with a little sugar, and cooled by placing the cup in ice; a little wine may be added. He claims that this food prevents the hypersecretion of acid that is so prone to cause pain and vomiting. At the same time 30-grain doses of bismuth are given twice or thrice daily and continued for 10 days. The food is increased daily by $3\frac{1}{2}$ ounces of milk and 1 egg, so that at the end of the first week the patient is getting some $1\frac{1}{2}$ pints of milk and 6 to

8 eggs. This amount is maintained for a further week. About the sixth day the patient also takes 35 grammes of raw chopped meat, alone or stirred up with the eggs, and if well digested, 70 grammes on the following day. He is now able to take some rice or gruel, and softened rusks. In the third week a light mixed diet is given, the meat being lightly broiled, and strict orders are given to masticate the food thoroughly. Lenhartz prefers to leave the bowels unmoved for the first week, so as to avoid exciting peristalsis: in the second week they are moved with small injections of warm water or glycerine, and after this he tries to control them by means of food. At the end of the first week he gives Blaud's pills made soft with glycerine twice or thrice a day. In severe cases arsenious acid is also given in increasing doses for a week, and then gradually diminished.

We feel bound to express unqualified dissent from Lenhartz's system in one point at least, viz., in the administration of food by the mouth immediately after a recent hæmorrhage. Peristaltic movements of the stomach must ensue and will almost certainly detach a recent thrombus from the mouth of a bleeding vessel. In our experience, also, very few patients are able to tolerate the full amount of food which Lenhartz considers desirable.

In the next place we will consider the value of certain medicines which have been employed—(*a*) for their local cicatrising action on the ulcer itself; (*b*) for the relief of pain and vomiting; and (*c*) for the arrest of hæmorrhage.

It has been maintained, and we think justly, that the administration of **alkaline carbonates,** by preventing or neutralising the hyperacidity and so lessening the irritation of the gastric secretions, assists in promoting healing of the ulcerated surface, and that they promote the passage of the food into, and its digestion in, the small intestine. Practical clinical experience affords abundance of evidence of the value of alkalis administered at suitable times

in such cases. Niemeyer, who was an admirable clinical observer, says, "The therapeutic use of the alkaline carbonates has a wonderful effect in chronic ulcer of the stomach." *

A combination of sodium bicarbonate, magnesium carbonate, and bismuth carbonate or subnitrate is one of the most efficacious prescriptions (together with a milk diet) in the treatment of average cases of chronic gastric ulcer as we meet with them in hospital practice. The magnesium carbonate, being an insoluble substance except in the presence of an acid, will continue to neutralise or diminish the gastric acidity so long as any of it remains undissolved. And we think there can be little doubt that when the stomach is empty and contracted, and the patient lying recumbent in bed, the mixture of bismuth and magnesia must form more or less of a protective covering to the ulcer, and so favour the healing process. The following is a suitable formula for these cases:—

℞ Bismuthi carbonatis ... ... gr. xx.
Magnesii carbonatis ... ... gr. x.
Sodii bicarbonatis ... ... gr. v.
Aquæ .. .. ad ℥j.

Misce, fiat haustus. To be taken ½ an hour before food, three times a day.

Much larger doses of bismuth than this are given by French and German physicians. Rosenheim gives as much as 150 grains for a dose, in the morning fasting, mixed with 6 ounces of water. Ewald also approves of these large doses. Fleiner has, too, adopted a successful method of treating gastric ulcer with large doses of bismuth, but he resorts to the use of the stomach tube, through which the bismuth salt, suspended in water, is poured into the stomach. We think the use of this tube objectionable and needless, and prefer a modification of his method such as the following: Let the patient, in the early morning, drink slowly about 12 ounces

* "Text-book of Practical Medicine," vol. i., p. 513.

of warm water containing, in solution, 60 grains of sodium bicarbonate and 20 grains of sodium chloride to wash the mucous membrane; about half an hour afterwards let the patient take a mixture of 100 grains of bismuth carbonate shaken up with 6 ounces of warm water. This may be given daily for a fortnight or three weeks. The patient should remain in bed; subject to this the posture is immaterial, as radiography has taught us that the bismuth is equally distributed over the whole surface of the stomach.

Cohnheim recommends 2 to 4 ounces of olive oil in place of the large doses of bismuth, and administers it through a tube after an initial lavage carried out by Fleiner's method. Colnheim claims that the oil protects the ulcer and assuages pain, relaxes pyloric spasm and relieves vomiting, checks hypersecretion of acid and at the same time functions as a food. The olive oil may alternatively be given in doses of an ounce or more three times a day before food.

Normal horse serum has of late been strongly recommended in the treatment of peptic ulcer: doses of 25 c.c. have been administered daily by the mouth. Any benefit that may be derived from it is probably due to its acid-fixing property.

In more troublesome chronic cases we have found **nitrate of silver** of considerable value. We believe that suitably administered it forms a protective covering to the ulcerated surface and promotes healing, but much, no doubt, depends on the situation of the ulcer; it is quite conceivable that an ulcer on the posterior wall of the stomach would be much more amenable to such action than one on the anterior surface, and it would be necessary also that the stomach should be as nearly as possible empty at the time of administration. The following pill may be given three or four times a day about half an hour before food:—

Argenti nitratis ... ... gr. $\frac{1}{3}$.
Unguentum kaolin, quantum sufficiat
Ut fiat pilula.

Max Einhorn * prefers giving the argentic nitrate in solution in distilled water, from $\frac{1}{3}$ to $\frac{1}{2}$ grain dissolved in a wineglass of distilled water half an hour before meals three times a day. As the ulcer is more commonly situated at the pyloric end of the stomach, it has been suggested that the patient should lie on his right side after taking such a dose.

Boas uses a solution of silver nitrate, 4 grains to 4 ounces of water, and gives it three times a day for eight doses on an empty stomach ; then a solution of 5 grains to 4 ounces for sixteen doses, and afterwards 7 grains to 4 ounces for the same number of doses.

The antiseptic action of both bismuth and nitrate of silver may have something to do with their beneficial effects in these cases.

Some physicians† have advocated the use of the tincture of perchloride of iron as a remedy which promotes a healthy, healing action in the ulcerated surface and allays pain in certain anæmic cases. It may be given in 5-minim doses in two tablespoonfuls of water several times a day. We have often employed with advantage a combination of citrate of iron and ammonia with subcarbonate of bismuth.

Of the various remedies used for the relief of pain and vomiting, in addition to those incidentally mentioned, we have opium, chloroform water, hydrocyanic acid, cocaine, creasote, chloretone, ice, applied externally and internally, hot fomentations, and counter-irritation.

Few cases of chronic ulcer of the stomach can be satisfactorily treated without the occasional use of **opium**, especially for the purpose of calming those severe attacks of pain and vomiting which commonly occur during the course of the disease. Brinton maintained that over and above its influence in relieving pain, opium was essential to the cure of

* "Diseases of the Stomach" (2nd edit.), p. 230.
† Gerhardt and Luton.

gastric ulcer; we are unable to share this view, as we have repeatedly seen rapid recoveries from gastric ulcer without the administration of a single dose of opium.

A pill of the extract of opium ($\frac{1}{2}$ grain or a grain) may be given two or three times in the twenty-four hours until the pain is relieved; or 5 to 15 minims of the liquor opii sedativus, according to the severity of the pain, may be added to each dose of the bismuth and magnesia mixture already mentioned, or it may be given combined with a tablespoonful of lime water; or if there is great irritability and intolerance on the part of the stomach, a hypodermic injection of $\frac{1}{6}$ to $\frac{1}{4}$ grain of hydrochloride of morphine may be given; or small doses of morphine ($\frac{1}{12}$ to $\frac{1}{6}$ grain), combined with dilute hydrocyanic acid 3 to 5 minims, in a tablespoonful of water, may be given by the mouth every three or four hours with good effect.

As an alternative to the employment of opiates when any objection exists to their use, cocaine may be given. It produces anæsthesia of the gastric mucous membrane, and so allays pain and lessens the sensation of hunger. A tablespoonful of the following may be given from time to time:—

℞ Cocainæ hydrochloridi ... ... gr. ij.
Aquæ laurocerasi ... ... ʒvj.
Aquæ ... ... ad ʒiij.
Misce, fiat mistura.

Anæsthesin has been recommended as a substitute for cocaine, as being devoid of toxic effects and free from the risk of establishing a "habit." In our experience, however, it is greatly inferior to cocaine in its local effect.

Creasote shaken up with water in the proportion of 1 minim to 2 ounces, and given in doses of one tablespoonful every two or three hours, has been found to relieve both pain and vomiting in some troublesome chronic cases; its antiseptic and antifermentive action may here be of value.

The internal and external use of ice has been found of service in allaying gastric irritability and relieving pain. If an ice-bag is employed, it should be suspended from a cradle, so that the advantage of cold may be obtained without the disadvantage of undue pressure. Leeches to the epigastrium, hot poultices and blisters, have their respective advocates. Leube and von Ziemssen use warm linseed poultices by day and a cold compress at night. In obstinate cases of fixed pain referred to the epigastric region a small blister applied to the painful spot may be of benefit, and the raw surface may be dressed with morphine. When pain is due to hyperacidity, belladonna is often of use by diminishing gastric secretion. Olive oil or almond oil in doses of 1 to 2 ounces at a time serves the same end.

In hæmorrhagic cases the strict dietetic method already outlined must be rigidly applied, and all food for a time must be given by the bowel. The hypodermic injection of morphine and such other measures as are referred to in the section on Hæmatemesis (p. 137) may be employed. The most complete physical rest must, of course, be enforced.

Transfusion, in cases of alarming hæmorrhage with symptoms of collapse, is rarely adopted now, as a subcutaneous injection of a physiological salt solution has taken its place—4 to 6 parts of sodium chloride to 1,000 parts of distilled water: 20 to 30 ounces of this solution, warmed to the blood temperature, may be injected into the connective tissue under the skin, in the flank.

Although **perforation** of the stomach as a consequence of gastric ulcer is often speedily fatal, recoveries are now more frequent since the adoption of operative measures has become more common. If, for any reason, operation cannot be had recourse to, the patient should be brought quickly under the influence of opium—preferably by hypodermic injections of morphine or by opiate enemata, as it is undesirable to allow anything to pass by the

mouth into the stomach. Twenty drops of tincture of opium in 2 ounces of thin starch mucilage may be injected every hour into the rectum, or $\frac{1}{3}$ grain of hydrochloride of morphine may be given hypodermically every hour for three or four doses. Ice-cold compresses to the abdominal surface are useful in allaying peritonitis; some, however, prefer warm fomentations, to which some tincture of opium may be added. The free use of opium will, at any rate, relieve the sufferings of the patient, if it does nothing more.

Thirst may be relieved by washing out the mouth, or sometimes by sucking small pieces of ice, or warm water may be injected into the rectum, and if stimulants are needed, they must also be given in enemata or injected hypodermically.

We must now refer briefly to the **surgical** measures which have been proposed in connection with the treatment of peptic ulcer. In 311 gastro-enterostomies for gastric or duodenal ulcer the Mayos had but 1 death and only 3 secondary operations. Moynihan had but 2 fatal cases out of 114 operations for duodenal ulcer, excluding perforation. Mayo Robson * and Moynihan state that, according to their statistics, the mortality of gastric ulcer treated surgically is only 5 per cent., which they contrast with 25 per cent. of deaths in cases treated medically: they claim that the operation affords complete relief in 90 per cent. of cases. Mayo Robson thinks that "medical should give place to surgical treatment at a much earlier period than has hitherto been the custom," yet he is not in favour of a "sweeping change" in this direction, but holds that the medical treatment should be "more rigid and more prolonged." He considers that "in all cases of gastric ulcer, except in cases of perforation, medical treatment should be first tried." But when the symptoms of ulceration recur and prove intractable to medical treatment,

* "Diseases of the Stomach and their Surgical Treatment" (1904).

gastro-enterostomy should be performed. This operation secures "physiological rest by means of drainage, thus allowing the ulcer to heal without being subjected to the irritation of acid secretion, accumulation of food, or frequent stomach movement." It also remedies "the hyperchlorhydria, relieves pyloric spasms, and, while preventing the stagnation of fluids, cures or materially diminishes gastric dilatation." Feeding by mouth with albumin water can be commenced as soon as the anæsthetic nausea has passed, and within forty-eight hours of operation most patients can take broths, thin gruels, custards, and so on.

If the operation has been undertaken for the relief of obstinate and serious hæmorrhage, and if an ulcer be discovered, it should, if possible, be excised, as that operation offers the likeliest method of cure. But, except for the cure of hæmorrhage, direct treatment of the ulcer by excision is unnecessary.

It is in chronic cases that the best results are obtained from operation, but in cases of acute hæmorrhage Mayo Robson thinks it best to rely upon medical treatment, which has been found to succeed in 93 per cent. of cases, as operative treatment in these cases is attended by a very high rate of mortality. Surgical treatment may also be needed in dealing with intractable pain and vomiting, and such complications as adhesions, pyloric contractions which may give rise to tetany, dilatations and hour-glass contractions, leading to loss of flesh and impairment of health, and subphrenic abscess.

It is especially in cases of repeated chronic hæmorrhages that operation should be resorted to. For operative details we must refer to the work already quoted.

The results of surgical treatment of perforation of gastric and duodenal ulcers are now much more favourable than they were formerly, a circumstance doubtless greatly due to the fact that operative measures are adopted much earlier than they used

to be. Robson and Moynihan * estimate the mortality after operation for perforation of gastric ulcer at 40 to 50 per cent., although in the first 100 cases operated on the mortality was between 70 and 80 per cent.; in cases operated on within twelve hours of rupture the mortality is well under 30 per cent. The prospect of recovery from perforation of a duodenal ulcer is less good than in the case of gastric ulcer, and the mortality is over 60 per cent.

The death-rate in cases of perforation treated without surgical operation has been estimated by all authorities as over 95 per cent. Operation ought therefore to be undertaken as soon as the diagnosis of perforation is made. For details as to the method of operating we must refer to surgical treatises, but we may say generally that it is usual to adopt every precaution against shock—an injection of strychnine is given, the operating table is heated, and the patient's limbs are enveloped in cotton-wool. The abdomen is opened by a free incision in the middle line above the umbilicus and the perforation in the walls of the stomach rapidly and carefully searched for, and when found it is sutured. Excision of the ulcer is not necessary or usual unless it makes suturing easier. After the ulcer has been closed the peritoneal cavity is thoroughly and methodically cleansed.

The **after-treatment** of cases of cured gastric ulcer must be conducted on general principles. The anæmia must be treated with mild preparations of iron, the dyspepsia by careful and cautious feeding; the frequent coexistence of constipation should be treated by enemata of salt and water (a teaspoonful to a pint of water), or by a dose of Carlsbad salts in the morning, fasting, in the manner already indicated. Leube recommends a course of the Franzensbad or Elster waters on account of the iron they contain, in addition to aperient sulphates, and in recent cases

* "Diseases of the Stomach and their Surgical Treatment" (1904), p. 314.

Gerhardt and Bamberger strongly recommend the course at Carlsbad.

It cannot be urged too strongly that much of the failure of treatment by medical measures in gastric ulcer is due to the fact that they are, as a rule, maintained for a hopelessly insufficient length of time.

If persistent cardialgia and dyspepsia are found to follow the cicatrisation of gastric ulcer, it is probable either that the cicatrisation has led to the compression of some filaments of the gastric nerves, or that adhesions to adjacent organs have formed, producing painful dragging or tension during the movements of the stomach in the processes of digestion. The pain due to perigastric adhesions may be so severe as to necessitate an operation for their removal—gastrolysis, as it is called—or, if this be impossible, a short-circuiting operation. Extensive cicatrisation near the pyloric end of the stomach may lead to stricture and subsequent dilatation of the stomach, the appropriate treatment of which conditions will be considered hereafter. Klemperer has attempted to get rid of such fibrous bands by hypodermic injections of thiosinamine 10 parts, glycerine 20 parts, distilled water 70 parts, half a syringeful three times a week. Recently fibrolysin has been recommended as a substitute for thiosinamine, which is prone to excite local irritation and pain.

Especial care must be taken of the patient during the menstrual period, as it is generally recognised that menstruation has a tendency to influence a recurrence of hæmorrhage.

Finally, when we are in doubt whether a case is one of gastric ulcer or not, it is best, especially if we have to do with a young or chlorotic girl, to treat the case as if it were one of ulceration, for it is precisely in this class of patient that perforating ulcer of the stomach is apt to run a latent course and to end suddenly in perforation or be attended with sudden and profuse hæmatemesis, and even if the case should not

be one of ulceration, but simply one of functional disease, the strict dietetic treatment appropriate to the former condition cannot do harm in the latter, but rather good—indeed, it may serve as a prophylactic measure, especially if followed by suitable tonic treatment.

Cancer of the Stomach

Cancer of the stomach has been universally regarded as an incurable disease, and its treatment as mainly symptomatic and palliative, considered apart from those surgical procedures which have, in recent years, been applied to certain forms of this affection. It is a disease of frequent occurrence, for cancer affects the stomach more often than any other organ, and its frequency is said to be steadily increasing.*

Although cancer of the stomach is an incurable malady, we have had reason to believe that the rapidity of its course, in some of its forms, may be considerably modified by appropriate medical treatment, and the comfort and strength of the patient maintained even for years.

As the **causes** of cancer, and the conditions that give rise to its development, are, at present, but little known, no causal indications for treatment can be formulated. The attainment of a certain age seems to be one of the conditions of its occurrence, cancer of the stomach being especially a disease of middle and advanced life. It is rarely encountered in persons under 30 years of age, it is most common between 40 and 60; but a goodly number of cases occur between 30 and 40, and after 60.

It is widely believed that chronic gastric ulcer is a predisposing factor, and many cases have been observed in which cancer formation was found to have developed on the rim or scar of a gastric ulcer. The opinion that cancer is of parasitic origin is a popular one, although it cannot be said to be, as yet, established.

* Einhorn: "Diseases of the Stomach" (2nd edit.), p. 249.

The seat of cancer of the stomach is in the great majority (viz. in four-fifths) of the cases limited to that comparatively small portion of the stomach containing its two orifices—the cardia and the pylorus—and the intermediate lesser curvature. The fundus is very rarely affected, in not more than $1\frac{1}{2}$ per cent. of all the cases. The pylorus, or its immediate neighbourhood, is the part most frequently attacked; three-fifths of the cases of gastric cancer are seated at the pylorus, and it is in this proportion, of all cases of cancer, that the morbid conditions we have to treat are those resulting from pyloric obstruction. Gastric cancer is almost always primary.

Cancer located at the cardiac or pyloric orifices naturally gives rise to mechanical difficulties either in the entrance of food into the stomach or in its escape from it, and to the symptoms and morbid manifestations dependent thereon. Cancer not involving either of these situations, and not interfering with the entrance or exit of the food, may exist for some time without giving rise to any characteristic symptoms, and may even remain undetected throughout its whole course.

It is important to bear in mind, especially in estimating the probable result of surgical operation, that gastric cancer is often attended by secondary cancerous deposits in other organs, and most frequently in the liver.

The **symptoms** of cancer of the stomach are not always clearly diagnostic, inasmuch as many of them are common also to cases of chronic gastric catarrh with dilatation from other causes, and to cases of chronic ulcer. The loss of appetite, the pain after taking food, the flatulence and dyspepsia, the vomiting, the sour eructations, the progressive emaciation, the occurrence of hæmatemesis, the constipation, the presence of blood in the stools, the tenderness in the epigastric region, and the signs of dilatation of the stomach may all exist without the presence of cancer; and it is on this account that it is difficult to

diagnose with accuracy the existence of cancer of the stomach, unless there are clear signs of a tumour in the epigastrium. The abrupt onset of a train of serious gastric symptoms in a middle-aged or elderly patient, whose digestive functions hitherto have been perfectly normal, should always excite a suspicion of cancer.

There are, moreover, certain appearances which, taken collectively, point strongly to the existence of cancer, although neither of them alone may be absolutely diagnostic. One of these is the peculiar colour of the complexion, which is associated with the progressive emaciation—that aspect which has been termed "earthy," or "waxy," or "fawn-yellow," or "dirty-yellow, cachectic colour," none of the terms expressing very well the peculiar type of complexion which so commonly accompanies malignant visceral disease, but which is readily recognised by the experienced eye.

The loss of appetite is usually much more complete and persistent in cancer than in chronic ulcer or chronic catarrh.

The pain of cancer is often almost continuous, and not merely excited by the presence of food, as in simple ulcer, and when it is dependent on the presence of food it usually appears not immediately after taking food, as in ulcer, but when digestion is more advanced; this is especially the case in pyloric cancer.

The vomiting usually occurs a longer time after taking food than in gastric ulcer, and in cases of cancerous obstruction of the pylorus it may not come on until some hours after the reception of food, and may be extremely copious from the co-existence of great dilatation of the stomach. When the cardiac orifice is the seat of cancer there is usually some dysphagia, and the food is regurgitated rather than vomited almost immediately after it is taken, unchanged, or simply mixed with mucus. Whenever we find this persistent regurgitation of food, with

signs of atrophy of the stomach, such as sinking-in of the epigastrium, and a difficulty or inability to pass the œsophageal bougie, together with the presence of a cachectic aspect, the existence of cancer of the cardiac orifice of the stomach is pretty certain.

"Coffee-grounds" vomit, or vomited matters coloured blackish-brown, from the presence of blood oozing from the ulcerated surface of the cancerous mass, and altered by contact with acid gastric secretions, is observed in many cases of somewhat advanced gastric cancer. If blood corpuscles cannot be detected by the microscope, hæmin crystals may perhaps be found. Copious hæmorrhage is far more common in chronic ulcer than in cancer. The presence of blood in the stools (melæna) is often observed in gastric cancer, when there may be no blood in the matters vomited, or when vomiting is absent. Pus or occasionally cancerous particles may be found in the vomited matters.

The emaciation and anæmia in cancer are usually more marked, more uninterrupted and progressive, and more distinctly cachectic than in chronic ulcer or chronic gastric catarrh. The anæmia is sometimes so profound as to excite a suspicion of pernicious anæmia.

The occurrence of fever has been several times noted in the most advanced stage of this disease, and is of evil import. The rise of temperature is not usually very high, and it has been observed, in some rare cases, to be periodical, and to resemble a malarial pyrexia. It may be accounted for either by the occurrence of an inflammatory process in the vicinity of the growth, or, more commonly, by the absorption of toxins from its ulcerated surface.

It has been stated that the absence of free hydrochloric acid in the gastric juice is characteristic of dilatation of the stomach due to cancer, and that this gastric juice has a very feeble digestive power for albuminous substances. Although the absence of free hydrochloric acid in the gastric juice may be discovered in other diseases besides cancer—for

example, in severe gastric catarrh and atrophy of the stomach—there seems to be little doubt that its invariable presence is strong evidence against the existence of cancer.* Osler, in an analysis of 87 cases, found free hydrochloric acid absent in 92 per cent. Free hydrochloric acid is naturally far more often absent in the late than in the early stages of cancer of the stomach. It has also been asserted that the presence of lactic acid developed in the stomach is diagnostic of cancer, but this has been controverted by others, although it is generally admitted that the presence of lactic acid and the absence of free hydrochloric acid help to establish a correct diagnosis. The presence of a large amount of lactic acid is certainly of great importance in diagnosis, particularly if this is associated with the presence of Boas-Oppler's lactic-acid-forming bacilli, absence of sarcinæ, presence of streptococci, staphylococci, or diplococci, absence of hydrochloric acid, and the finding of blood or pus in the gastric contents.

Constipation, which is usually very obstinate, and is probably due to the small amount of food digested and passing out of the stomach, is a symptom which has to be considered in the treatment of these cases. The occasional occurrence of diarrhœa is not, however, uncommon. This may be due to the irritation of undigested food, or to the existence of intestinal catarrh, excited by decomposing matters proceeding from the ulcerated surface.

The careful analysis of each case as it comes before us, especially with reference to the symptoms enumerated, will usually enable us to arrive at a correct diagnosis; and if this is coupled with the presence of

* Ewald says: "In the large majority of cases of carcinoma of the stomach there is no free hydrochloric acid. This is, however, not caused by the mystic influence of the carcinoma on the production of hydrochloric acid, but simply by the accompanying catarrhal inflammation or atrophic condition of the mucous membrane of the stomach. Should these conditions be absent, then there will be a copious secretion of hydrochloric acid."—("Diseases of Stomach," vol. ii., p. 397.)

a painful tumour in the situation of the stomach, the diagnosis is virtually certain.

After these preliminary considerations we may now proceed to consider the **indications for treatment** in cases of gastric cancer. The first of these is a suitable regulation of diet. In arranging the diet of a patient with cancer of the stomach we must endeavour to supply as much nutriment as will adequately meet the demands of the body, so as to check the progressive emaciation, and at the same time reduce to a minimum the work of gastric digestion, and the pain and distress connected with it. The food we give should either be easily absorbable by the stomach itself, and cause little or no irritation by its presence there, or should pass readily out of the stomach and be absorbed lower down in the alimentary canal. We must not, however, under-estimate the digestive capacity of the stomach itself in all patients with gastric carcinoma : in some it is very considerable. We have known cases in which a fair amount of solid animal food was taken and digested, for years, with only occasional attacks of severe dyspepsia. An important point to keep in view in the feeding of cases of cancerous stricture of the pylorus is to give such food as can be digested and partly absorbed in the stomach, while the residue will pass the narrow pyloric outlet with as little resistance as possible. This will inevitably restrict us to fluid and semi-fluid foods, small in quantity and of high nutritive value. The starchy, farinaceous foods should therefore be avoided unless predigested, for they cannot be digested in the stomach, and we know there exists an obstruction to their passing out of that organ, and the result is that they are retained there, where they give rise to the development of lactic and butyric acids, and consequently to the occurrence of much pain, with troublesome nausea and vomiting. When farinaceous foods are found to give rise to pain, gastric distension, and vomiting, they should be suppressed, and the diet restricted absolutely to

concentrated meat *solutions and foods that can be absorbed in the stomach;* or, on account of their perfect fluidity, pass easily into the small intestine. If the cancerous growth does not involve the pylorus there is not the same objection to the carbohydrates, because there is not then the same risk of their retention and acid decomposition in the stomach. In cancer of the stomach the food, generally speaking, should be fluid and concentrated, so as to be of small bulk. Milk, when well borne, is excellent in small quantities at a time. It is desirable to dilute it slightly with some alkaline water, and the addition of a little salt to boiled milk makes it more palatable. When ordinary fresh milk disagrees, peptonised milk or buttermilk may be substituted for it. Eggs, raw-meat juice, tea, coffee, and cocoa may all as a rule be given with the milk. Martinet recommends a diet of curds.

In hæmorrhagic cases it may be necessary for a time to feed the patient entirely by means of nutrient enemata so as to keep the stomach absolutely at rest; and indeed, in non-hæmorrhagic cases, it is a good expedient from time to time to feed the patient for a few days per rectum, so as to give the stomach periods of entire rest.* It is specially useful in cases when the patient will not submit to systematic lavage of the stomach.

Professor Bauer corroborates our own view of the desirability, in carcinoma of the stomach, of giving "animal, highly-albuminous foods, as milk, eggs, and tender meat, and meat juices, in preference to those which, from the large amount of hydrocarbon they contain, are easily prone to abnormal and acid fermentation."

In these cases a certain amount of choice may be afforded the patient, who has often learnt by observation the particular kind of diet that suits him best. But it should always be in small quantity at a time; on this point few patients can be left with safety to

* For directions as to rectal feeding *see* p. 42.

their own inclinations. A small amount of wine, especially champagne, or of good old brandy may usually be allowed. There is some evidence to show that alcohol aids the absorption of food from the stomach.

In a few cases a dry diet has been found to agree better than a fluid one. Much, no doubt, depends on the seat of the disease and the secondary changes, such as dilatation, etc., to which it has given rise, so that each individual case must be studied carefully as to the facility with which different articles of food can be digested. In cancer of the cardiac orifice we are restricted to fluid food, as solid food would be arrested, and would accumulate in the œsophagus and cause dilatation. If the stricture of the cardiac orifice is considerable it may be advisable to introduce a stomach tube through the stricture and in this way introduce food into that organ; or nutrient enemata of peptonised foods may be given.

Besides appropriate dieting, the treatment of cases of gastric carcinoma involves the utilisation of such means as are at our disposal—(*a*) for the arrest of the abnormal decomposition and fermentation of the food retained in the stomach; (*b*) for the relief of pain, acidity, and vomiting; (*c*) for the arrest of hæmorrhage; (*d*) for the regulation of the bowels. Finally, in certain cases the adoption of surgical measures to remove the diseased part may be feasible.

When the cancer is situated at the pylorus, and there is considerable dilatation of the stomach, very good results have been obtained by washing out the stomach by means of the siphon tube,* night and morning. The mucous membrane is cleansed by this process, and the acid, irritating matters resulting from the prolonged retention of food in the stomach are removed. The feelings of distension and heart-burn are relieved, and the tendency to hæmorrhage diminished. Appetite is often restored, and the patient may for a period acquire a sense of almost

* *See* under Dilatation of Stomach, p. 127.

absolute well-being. Constipation is also frequently removed by this process, probably by improving the general tone and facilitating the passage of food along the intestinal canal. This treatment is unsuitable in cases of great debility or when hæmorrhage is actually taking place.

Charcoal in 10- to 20-grain doses, three or four times a day, has been found to relieve the flatulence and acidity suffered from in these cases; or a powder composed of equal parts of charcoal, subnitrate of bismuth, and carbonate of magnesia has been used for the same purpose. Ewald, however, condemns the use of charcoal as "irrational," and we are inclined to think its value has been over-estimated.

We have found the greatest benefit from the use of creasote or thymol, together with a suitable diet, in cases of cancer of the pylorus; the tendency to flatulent decomposition of food in the stomach being often completely averted. A minim of creasote in a capsule may be given thrice daily immediately after taking food, or a grain of thymol, made into a pill with powdered soap and a little spirit, may be used instead, especially when the patient objects to the odour of creasote. Resorcin is preferred by some, and bismuth salicylate and carbolic acid by others.

The risks of morbid fermentation will also be diminished and digestion promoted by giving 10 or 15 grains of pepsin, with 10 to 20 minims of dilute hydrochloric acid, after each meal containing albuminous food. This will supply the deficiency of hydrochloric acid and of digestive activity in the gastric juice of such patients, and enable them to digest small quantities of pounded meat, eggs, fish, etc.

To relieve the pain of gastric cancer it will often be necessary to give opium; but when the pain is associated with, and dependent upon, acidity of the contents of the stomach, the administration of an alkaline carbonate will frequently effect this object without the need of having recourse to the preparations of

opium. Both pain and vomiting may often be relieved by the following combination :—

℞ Sodii bicarbonatis ... ... gr. xv.
Magnesii carbonatis ... ... gr. v.
Acidi hydrocyanici diluti ... ... ♏iv.
Aquæ anethi ... ... ad ʒj.
Misce, fiat haustus. To be taken three or four times a day.

Slight attacks of pain will sometimes yield to the administration of Hoffmann's anodyne, with hot fomentations or an ice-bag to the epigastrium. Aspirin in 10- to 15-grain doses sometimes exerts an anodyne effect, or orthoform in repeated doses of 1 grain.

Severe attacks of pain will, however, require the use of opium. A great objection to its use is that by checking the hepatic and intestinal secretions and diminishing peristalsis it aggravates the constipation, and removes even the little appetite the patient may have. Its employment should be deferred as long as possible. Morphine, given hypodermically and combined with atropine, is, perhaps, the best method of administering it; $\frac{1}{6}$ grain of sulphate of morphine and $\frac{1}{120}$ grain of atropine will usually suffice; this quantity must be increased, if necessary. Codeine, in doses of $\frac{1}{3}$ or $\frac{1}{2}$ grain, with or without extract of belladonna, is a good substitute for opium. Another suitable mode of administering opium is to combine it with cherry-laurel water, as in the following :—

℞ Liquoris opii sedativi ... ... ♏v.
Aquæ laurocerasi ... ... ♏xxx.
Aquæ chloroformi ... ... ad ʒj.
Misce, fiat haustus. To be given when the pain is severe.

If vomiting is persistent and unrelieved by hydrocyanic acid, or this combined with opium, oxalate of cerium will sometimes succeed in arresting it. One or two grains mixed with a few grains of sugar of milk may be given every three or four hours.

Or hydrochloride of cocaine may be given :—

℞ Cocainæ hydrochloridi ... ... gr. ij.
Aquæ laurocerasi ... ... ʒj.
Aquæ destillatæ ... ... ad ʒiv.

Misce, fiat mistura. A tablespoonful every hour until relieved.

Iced water or effervescing soda-water or iced milk may be at the same time taken in small quantity, or fragments of ice may be sucked. Cold compresses to the epigastrium have been found useful. When the patient does not object to washing out the stomach this measure will contribute to the relief both of pain and vomiting.

The occurrence of serious hæmorrhage will require the same mode of treatment as that described for hæmorrhage from simple ulcer.

The constipation accompanying gastric cancer is best relieved by enemata, and these by unloading the intestine often greatly relieve the suffering caused by flatulent distension. In some cases 1 or 2 grains of watery extract of aloes, with 2 of soap, in a pill, daily, at bedtime, is well tolerated; or half a dram or a dram of the aromatic syrup of cascara sagrada.

Cajuput oil has been recommended for the relief of flatulence. It may be given in capsules, or it may be dropped on a small lump of sugar and swallowed.

When the more urgent dyspeptic symptoms have been relieved, and the patient is enabled to take and digest a sufficiency of suitable food, the anæmia and debility which are always present in these cases indicate the use of tonic remedies. We have found the following combination answer well :—

℞ Ferri et ammonii citratis ... ... gr. v.
Liquoris bismuthi et ammonii citratis... ♏xx.
Sodii bicarbonatis ... ... gr. x.
Infusi calumbæ ... ... ad ʒj.

Misce, fiat haustus. To be taken three times a day, an hour before meals.

Or the following:—

℞ Ferri et quininæ citratis ... ... gr. v.
Liquoris strychninæ ... ... ♏iij.
Acidi hydrochlorici diluti ... ... ♏v.
Aquæ ... ... ad ℥j.

Misce, fiat haustus. To be taken an hour after food, thrice daily.

Condurango bark was introduced by Friedreich for the relief of cancer of the stomach, and recently its use and efficacy have again been testified to in the treatment of this disease. The most remarkable effects have been ascribed to its use; 30 grains of the powder may be given four or five times a day, or a decoction may be used. It has been said by some that it has always given relief, the pain has disappeared, the digestion has improved, and the tumour has either ceased to increase in size or has disappeared entirely. But it has not given such brilliant results as these in the experience of the majority of those who have tried it. It has, however, been established by experimental tests that it does increase the digestive secretions, the gastric juice, the bile, and the pancreatic juice—especially the two latter—and that it may in this way do good in chronic disease of the stomach. Gerhardt has found it useful in the treatment of old gastric ulcer, and in cancer it has improved appetite and lessened pain and catarrh. Max Einhorn also states that he gives it in the greater number of cases of cancer of the stomach.

Reiss has made elaborate investigations into the effects of condurango in gastric cancer, and he concludes that an unprejudiced observer, after watching a large number of cases, would be of opinion that life is greatly prolonged by a course of treatment with it. Ewald also states that he has repeatedly observed the good effect of this drug on the general symptoms of cancer of the stomach, and he considers the observation of Reiss most important, and that his advice to give large quantities of this remedy should be followed.* In our opinion the usefulness of con-

* "Diseases of the Stomach," vol. ii., p. 419.

durango is limited to the improvement of appetite, and even in this it frequently disappoints expectation. All the vegetable bitters may be tried for the same purpose.

Sodium iodide has been given by Boas in a case of œsophageal cancer for more than six months (30 to 45 grains a day), and the patient gained weight and remained free from symptoms the whole time. This is probably due to the action of the iodide on the zone of inflammatory exudation around the growth. Einhorn, too, has noted "transient good results" from this drug in several cases of cardiac stenosis. The latter authority also mentions arsenic (3 minims of Fowler's solution thrice daily) as sometimes attended with benefit.

Ewald and Einhorn both speak highly of a 3 per cent. solution of chloral hydrate, a tablespoonful every two or three hours, for the alleviation of the discomforts caused when ulceration is in progress or decomposition of food is taking place.

The surgical operative procedures usually proposed for the relief of gastric cancer are the following :—

1. **Gastrostomy.**—This operation may be resorted to in cases where the cardiac orifice of the stomach is constricted by a cancerous growth, especially in cases of annular stricture ; it is less applicable in cases where the new growth is extensive and involves any considerable portion of the anterior wall and greater curvature—nor in any case is it likely to do more than prolong life for a short time. The operation is usually performed in two stages, and the stomach is not opened until adhesions have been established between the wall of the stomach and that of the abdomen. But when the urgency for administering food is very great, it is easy to give some concentrated fluid food in small quantities before the stomach is opened, by means of a larger kind of hypodermic syringe with a long needle—a syringe capable of holding half an ounce or an ounce, which can be repeatedly refilled while the needle remains in

the stomach. Mayo Robson says of gastrostomy: "If it be performed sufficiently early, and if it be done according to the best methods, it may be included among the most useful and beneficent operations the surgeon is called upon to perform."

2. **Pylorectomy,** or resection of the pylorus, an operation which is, of course, designed for the relief of malignant stricture of the pylorus. It consists in the removal of the pylorus and as much of the adjacent portions of the stomach and duodenum as may be involved; the divided walls of the stomach and the bowel are brought together and united by sutures. Another method, now frequently adopted, is "to close completely both the stomach and duodenal openings, either by a purse-string suture or by a double row of stitches, and then to connect the bowel to the stomach, making either a gastro-duodenostomy or a gastro-jejunostomy." * Professor Kocher prefers this operation, which has been very successful in his hands.

The objections made to pylorectomy are—(*a*) that it is itself a very fatal operation; (*b*) that there is a great tendency to early diffusion of malignant disease when situated within the peritoneal cavity, and there is little chance of complete removal of the cancerous deposits; (*c*) the tendency of the growth to the contraction of firm adhesions to surrounding parts; (*d*) the great length of time required for the operation; and (*e*) the risk of speedy recurrence. In opposition to these objections it has been urged that the operation is usually too long postponed, and that when performed early much better results are obtained.

3. **Gastro-enterostomy,** that is, the establishment of a permanent fistulous opening between the stomach and some part of the small intestine, usually the upper part of the jejunum.

A very large number of such operations have now been successfully performed, and the statistics of

* Mayo Robson, "Hunterian Lectures on the Surgery of the Stomach."

the more recent operations are far more favourable than those formerly reported—a result, no doubt, due to the circumstance that operative proceedings are now had recourse to much earlier than used to be the case.

In this operation it is, of course, extremely important to make the communication between the stomach and the upper part of the jejunum as near the pylorus as possible. Cases have been examined post mortem in which the juncture was found to have been made but a short distance from the ileo-cæcal valve!

This operation affords, perhaps, the best chance of successful palliation in cases of malignant stricture of the pylorus, when the sufferings of the patient are urgent and the failure in nutrition is rapidly progressing.

4. **Jejunostomy.**—When owing to the situation of the carcinomatous growth it is not practicable to make any operation upon the stomach itself, life has probably been prolonged by making a fistulous opening into the jejunum and introducing food through this channel.

5. **Total or partial gastrectomy.**—The bold operation of removing the entire stomach for cancer was successfully performed by Schlatter, of Zurich, in 1897, and this operation has been repeated by several American and English surgeons since, and in a few instances with success. Schlatter's case survived the operation fourteen months.

Partial gastrectomy for gastric cancer has been repeatedly performed. Langenbach in 1894 excised seven-eighths of the stomach and sutured the pylorus to the small cardiac portion of stomach remaining, and the patient made a good recovery.

The progress of gastric surgery has certainly been most remarkable and rapid of late years; but to ensure satisfactory results in cases of malignant disease it is most essential that surgical aid should be sought early; and when the diagnosis is doubtful, but the symptoms are urgent, an exploratory laparotomy should be advised.

ADDITIONAL FORMULÆ

Mixture in gastric ulcer

℞ Bismuthi carbonatis, ʒij.
Acidi hydrocyanici diluti, ʒj.
Liquoris morphinæ hydrochloridi, ʒj.
Mucilaginis, ʒvj.
Aquæ chloroformi ad ℥ij.
M. f. mist. A teaspoonful every three hours. (*Whitla.*)

Mixture in gastric ulcer

℞ Bismuthi carbonatis, ʒij.
Sodii bicarbonatis, ʒj.
Tincturæ belladonnæ, ʒj.
Infusi gentianæ ad ℥vj.
M. f. mist. Two tablespoonfuls three times a day. (*Ord.*)

In convalescence from gastric ulcer

℞ Syrupi aurantii corticis, ʒv.
Decocti condurango (1 to 9), ad ℥vj.
M. f. mist. A tablespoonful three times a day. (*Bamberger.*)

In gastric ulcer with hæmatemesis

℞ Plumbi acetatis, gr. iij.
Morphinæ hydrochloridi, gr. jss.
Sacchari albi, ʒj.
M. et divide in pulv. x. A powder every two hours.
(*Bamberger.*)

Or

℞ Acidi tannici, gr. xij.
Opii pulveris, gr. jss ad ij.
Sacchari albi, ʒj.
M. et divide in pulv. vj. A powder every two hours.
(*Bamberger.*)

In gastric ulcer with flatulent dyspepsia

℞ Potassii iodidi, gr. vj.
Potassii bicarbonatis, ʒjss.
Tincturæ aurantii, ʒiij.
Infusi calumbæ ad ℥vj.
M. f. mist. Two tablespoonfuls an hour after food.
(*Brinton.*)

Resorcin and condurango for gastric cancer

℞ Resorcin puri, gr. xxx.
Tincturæ rhei, ʒjss.
Syrupi aurantii, ʒv.
Decocti condurango (1 in 12) ad ℥vj.
M. f. mist. One tablespoonful every two hours.
(*H. Menche.*)

Condurango mixture for gastric cancer

℞ Condurango corticis, gr. cl.
Aquæ, ℥iij.
Boil for ten minutes, and add
Syrupi, ʒv.
Aquæ ad ℥vj.
M. f. mist. A tablespoonful every hour or two. (*Reiss.*)

As an antiseptic in gastric carcinoma

℞ Sodii sulphitis, ʒss ad ʒj.
Infusi quassiæ, ℥jss.
M. f. haust. To be taken three times a day. (*Jenner.*)

Alkaline and rhubarb powder for gastric ulcer

℞ Sodii bicarbonatis, ʒij.
Potassii bicarbonatis, ʒij.
Pulveris radicis rhei, ʒiv.
Sacchari lactis, ℥j.
M. f. pulv. As much as will go on the end of a knife to be taken dry every hour. (*Ewald.*)

Tonic in gastric cancer

℞ Extracti condurango, ʒxij.
Strychninæ sulphatis, g. ½.
Acidi hydrochlorici diluti, ʒiij.
Elixir gentianæ ad ℥viij.
M. f. mist. A tablespoonful, in a wineglass of water, to be taken through a tube after meals. (*Hemmeter.*)

CHAPTER V

TREATMENT OF DISEASES OF THE STOMACH: DILATATION, OR GASTRECTASIS

Causes—Symptoms—Physical Examination—*Treatment*—Dietetic Measures—Model Dietary—Emetics—Purgatives—Carlsbad Water — Tonics — Olive Oil — Electricity — Massage — Antiseptics—Lavage—The Stomach Siphon and Pump—Surgical Treatment—Pyloroplasty—Gastroplication—Additional Formulæ.

Dilatation of the stomach is a necessary consequence of stricture or obstruction at the pylorus, malignant or non-malignant, arising in the walls of the stomach itself or externally to it, and the treatment of this condition has been incidentally referred to in discussing the management of cases of gastric cancer. Adhesion of the stomach to an adjacent organ from localised peritonitis, in association with gastric ulcer, gall-stones in the gall-bladder, and other causes, may also produce dilatation by interfering with the muscular movements of the stomach.

But there are other and less frequent causes of gastric dilatation, and it is to these we must, in this chapter, chiefly refer.

The habitual consumption of excessive quantities of food or drink is calculated to lead, in course of time, to dilatation of the stomach, by repeated abnormal distension of that organ, so that it is common in excessive beer drinkers. Dilatation may likewise originate in an enfeeblement of the muscular coat of the stomach, brought on by debilitating diseases, such as chlorosis and anæmia, tuberculosis, typhoid and other fevers.

Broadbent suggests that dilatation is sometimes due to an anatomical peculiarity which hinders the expulsion of the products of digestion: "The pylorus is suspended high up in the epigastrium by a short lesser

omentum. . . . If the stomach is distended and overloaded it is dragged down by the weight of its contents, and an acute flexure is formed at the junction of the duodenum and pylorus, which constitutes an obstacle to the passage of the chyme."* Bennett argues that "extreme dilatation" may be sometimes due to "spasm of the pyloric sphincter";† and several authorities have called attention to the fact that a movable right kidney may be the cause of intermittent gastric dilatation.

Chronic gastric catarrh is a common cause of the slighter degrees of dilatation of the stomach, for not only does it lead to impairment of muscular contraction from defective nutrition, but as the secretion of gastric juice is defective and absorption therefore retarded, the food is delayed in the stomach, abnormal fermentation is set up, and flatulent distension, as well as accumulated ingesta, increases and aggravates the dilatation due to enfeeblement of its walls.

Retained ingesta, from whatever cause, and enfeeblement of the muscular walls of the stomach, however produced, are the essential conditions of gastric dilatation; increase of pressure from within, or diminished resistance in the walls of the stomach, or both together.

Cases of acute dilatation seem, as a rule, to be due to atony of the muscular walls, brought about usually by exhausting illnesses. But the condition is occasionally met as a consequence of gross alcoholic excess, especially when the stomach has been overloaded at the same time with solid food. It is also a rare sequel of chloroform narcosis, especially for the performance of laparotomy.

Many careful observers have directed attention to the frequent occurrence of gastric dilatation in rickety infants and young children. Both in breast-fed and hand-fed infants of feeble digestive power this morbid state may be detected—the digestive

* *Brit. Med. Journ.*, Dec. 2, 1893.
† *Ibid.*, Feb. 3, 1900.

processes are retarded, and as the child is constantly being fed, food accumulates, and is abnormally retained in the stomach, where it undergoes fermentive changes.

The coincidence of gastric dilatation with symptoms of nervous depression, hysteria, and hypochondriasis, has prompted the suggestion that the nervous conditions may have preceded and caused the dilatation.

High degrees of dilatation of the stomach are nearly always due to cicatrised ulcer, or cancer, or perigastric adhesions, and often fall more appropriately into the province of the surgeon than of the physician.

The consequences of dilatation of the stomach, however induced, are the lingering of food in that organ and the setting up of morbid fermentation and the production of toxic putrid substances, such as poisonous ptomaines. So that not only is the general nutrition gravely compromised, but the absorption of toxic substances tends further seriously to disturb the health of the patient.

The **symptoms** of dilatation of the stomach when this is caused by pyloric stenosis will, of course, have been preceded by those of the original disease. But dilatation of the stomach, from whatever cause, is usually attended with a group of more or less characteristic symptoms, some of which are, however, common to other forms of dyspepsia.

In cases of acute dilatation the symptoms are those of acute dyspepsia, with vomiting of greater or less severity according to the urgency of the condition. Severe epigastric pain is common, and thirst invariable; the abdomen is not usually distended; the pulse is quick and small, and there is some degree of collapse, often with subnormal temperature.

In chronic cases there is usually a sense of weight and fullness about the epigastric region, aggravated by taking food, and not infrequently accompanied by a constant wearing pain, referred mostly to a particular

spot in the epigastrium which is sensitive to pressure. Heart-burn and nausea, with foul, acid eructations of fluids and gases, the latter sometimes not only putrid but even combustible, are complained of, and the patient's countenance is usually thin, pale, worn, and anxious. There are also usually great general emaciation and loss of strength, and vertigo is frequent.

Vomiting, although not an essential symptom, frequently occurs, and in cases of considerable dilatation is very characteristic. The quantity vomited is sometimes enormous, and it gushes out as if pumped up from the stomach, and is often unattended by nausea. The vomited matters consist of turbid, sour, bad-smelling liquid, usually highly acid, composed of tenacious mucus and the residue of half-digested food in a state of fermentive decomposition, with sarcinæ and other low organisms; if it contains also dark coffee-ground matters there is reason to fear the existence of pyloric cancer, and if bright blood be present, that of gastric ulcer. One of the most characteristic points to be noticed in the substances vomited is the presence of portions of undigested food taken long, it may be days or even weeks, before! The vomiting often occurs at regular intervals of twenty-four or forty-eight hours, or even longer. There is usually loss of appetite, but occasionally there may be a morbid craving for food, due to the defective absorption of nourishment.

Disturbances of cardiac action are often complained of, such as palpitations, intermittent and irregular pulse, and dyspnœa, especially on lying down at night, and these are due to displacement upwards of the diaphragm and pressure on heart and lungs from the dilated stomach.

Constipation is a common accompaniment, consequent on the imperfect emptying of the stomach. Owing, also, to the small absorption of fluids, the urine, in advanced cases, is frequently diminished in quantity. Coldness of the extremities is usual, and

cramps of the voluntary muscles have been often observed by Kussmaul, and referred by him to the abnormal dryness of the muscular and nervous tissues from deficiency of water in the blood.

Mayo Robson and others have called attention to the occurrence of tetanoid spasms in the higher grades of gastric dilatation. These are most frequent in the upper extremities, but are seen also in the lower limbs, and in the worst cases may spread to all the muscles of the body. They have been commonly referred to absorption of toxins, increasing the excitability of the nervous system; but there is some evidence to show that the presence of any foreign body in the stomach is capable of exciting tetany reflexly by mechanical irritation of the stomach. In the case of decomposing masses of undigested food both causes may be operative.

Physical examination of the region of the stomach affords an important aid to diagnosis. In cases of great dilatation the stomach may be seen to bulge the abdominal wall, and its outline may be defined with distinctness. The undue prominence of the umbilical region produces an apparent depression of the epigastrium. The outline of the stomach may be rendered more distinct by distending it with carbonic acid gas (as suggested by Frerichs), by first giving 40 grains or more of bicarbonate of soda, and then immediately afterwards 40 or more grains of tartaric acid, each dissolved in 5 ounces of water. Movements of the stomach, especially if its muscular walls be hypertrophied, may also be sometimes seen through the thinned abdominal walls. They can usually be excited by kneading the abdomen, or by the application of ice over the stomach. They may be readily distinguished from similar movements in the colon by their direction, exclusively from left to right across the upper abdomen. A splashing noise may often be produced on shaking the patient when upright. The mere existence of a splash is by itself of no importance, as it may be obtained in a healthy

stomach after swallowing a tumbler of water. But when it is found several hours after taking the liquid, or on rising in the early morning, it is very suggestive of a dilated stomach.

Percussion in the recumbent position usually reveals an extended area of gastric resonance, stretching considerably upwards above the left hypochondrium, and downwards to or below the umbilicus; and on the erect attitude being assumed, a band of dullness will usually be detected (caused by the gravitation of the fluid contents of the stomach) over the lower part of this area.

Auscultatory percussion is also a valuable method of examination. The stomach should first be moderately distended by drinking ½ pint of effervescing soda water, so as to bring it in contact with the abdominal wall. The stethoscope is then placed over the epigastrium, and a series of sharp taps are made with a finger of the right hand along lines radiating in all directions from the point of auscultation. A change of tone of the note is heard immediately the gastric area is passed; in this way the limits of the stomach can be accurately mapped out.

It is important in this connection to remember that the size of the stomach varies greatly in different individuals. Ewald estimates the maximum normal capacity at 1,600 c.c. (56 ounces = nearly 3 pints).

Of late years examination by **X-rays** after the taking of a **bismuth meal** has superseded the old methods of examination. To an adult 3 ounces of bismuth carbonate may be given in a large breakfast-cup of fine bread and milk. In a feeble and dilated stomach the bismuth is quickly precipitated to the lowest limit of the stomach chamber, and is not plastered over the interior of the stomach, as in the case of a healthy and active gastric muscle. Undue delay in the stomach is also exhibited.

Of still greater importance is the demonstration of *motor weakness* of the stomach, and for this purpose, in addition to the evidence derived from the bis-

muth meal, Boas recommends a test-meal, consisting of a plate of soup, a roll, and a beef-steak. The stomach tube should be introduced after the lapse of seven hours. The healthy stomach should be empty; a stomach which is merely feeble, but not dilated, will contain only a few remnants; but if there is actual dilatation as well, there will be a copious decomposing residue, not only from this, but even from previous meals.

It must be borne in mind that displacement of the stomach, gastroptosis, is often combined with dilatation, gastrectasis, and we must refer to what is said as to the treatment of this condition under the heading of Gastroptosis (p. 189).

Having now passed in brief review the causes and symptoms of gastrectasis, we must, in the next place, consider what modes of **treatment** are best calculated to cure or alleviate this affection.

We may first briefly dismiss the treatment of **acute dilatation.** If vomiting is urgent and pain severe, the stomach should be washed out at once through the soft tube, and repeated as often as necessary; following this a hypodermic injection of morphine and strychnine should be given. No food, not even fluid food, should be permitted by the mouth. Thirst may be relieved by injections of warm water into the bowel. If there is evidence of collapse, we may resort to subcutaneous infusion of saline solution, and the extremities should be kept warm with hot-water bottles. If there is reason to attribute the dilatation to actual obstruction there should be no delay in seeking surgical intervention, but even so the prospect of saving the patient's life is small.

In cases of **chronic dilatation** the following **indications for treatment** are sufficiently clear; the only question is how best to carry them out:—

1. To remove the decomposing residue of food and cleanse the stomach.
2. To prevent putrid fermentation by antiseptics, and by other means, e.g. careful dieting.

3. To impart tone to the feeble muscular walls of the stomach, to promote gastric digestion, and to supply nourishment, if necessary, in other ways.
4. To remove constipation.
5. To have recourse to surgical measures when the dilatation is due to pyloric obstruction, and does not yield to medicinal and dietetic treatment.

In advanced cases, with great and long existing distension, it will be difficult to carry out these indications except by the mechanical emptying and washing out of the stomach; but in less advanced cases of simple dilatation from atony of the gastric walls, and not dependent on organic obstruction, other means, medicinal and dietetic, will suffice, if diligently carried out, to effect a cure. When there is no objection on the part of the patient to "lavage" of the stomach, and nothing in the history of the individual case to contra-indicate it, it may be applied in both classes of cases; but great reluctance to submit to this treatment, especially in slight cases, is often encountered, and it is necessary, therefore, to be ready with other measures.

Leaving for subsequent consideration the application of "lavage," we will proceed to consider those other remedies.

And first, with regard to the necessary dietetic measures: It has been said that in such cases we should order small quantities of food frequently: it is certain that the food should be small in quantity, concentrated and easy of digestion, or predigested, but we entirely object to frequency of feeding.

In such patients the process of digestion is often excessively slow, and even small quantities of food, if given frequently, will tend to accumulate and undergo morbid fermentation.

The supply of liquids should be strictly limited, and only a very small quantity allowed to be taken at meals—not more than 3 or 4 ounces; and it is better,

if possible, to put off taking even this amount until an hour after the meal. When there is a craving for fluids, it is a good plan to let the patient sip a teacupful of hot water half an hour before a meal; we shall thus lessen the desire to drink during the meal. And as a certain amount of water is needed for the physiological requirements of the body, and is also useful for cleansing the stomach, it is easy to supply this by causing the patient to drink a small teacupful of warm water or warm alkaline mineral water, such as Vichy, Vals, or Apollinaris, half an hour before each meal and at bedtime. The total amount of fluid given by the mouth should not range much above 2 pints in twenty-four hours.

Ewald lays great stress on the need of abstaining from liquids. He says, "I only allow a small quantity of milk, from a tea- to a table-spoonful, taken at short intervals." Still, as we have already said, a certain amount of water is a physiological necessity, and this, therefore, should be supplied in the way and at the times we have indicated, or, if needful, the requisite amount of water may be given by rectal injections. The amount of the urine will form a rough guide as to the necessity for additional fluid.

With a view to furnishing as much nourishment as possible in a limited supply of food, some prefer to give the bulk of the fluid in the form of milk. It should be given hot, and yolk of egg, brandy, or coffee may be suitably added.

As the food must be in small quantity, and therefore concentrated, it should be chiefly animal. The lean of tender meat from which all fibrous and tendinous structures have been removed is the best, and when there is any uncertainty as to its due mastication by the patient, it had better be mechanically divided by **mincing** or pounding before it is taken. Chicken, white game, fish (the more delicate kinds), lightly-boiled eggs, are also suitable forms of animal food. Bread and other starchy foods (carbohydrates) must be taken in small quantity only, as

they are prone to linger in and set up acid fermentation in the feeble, dilated stomach. All vegetable substances that tend to produce flatulence must be rigidly discarded. A small quantity of the most easily digested fresh vegetables may be taken in the form of purées. Some of the light farinaceous foods may also be taken in small quantities at a time, as tapioca, sago, rice, and macaroni. Fats, as a rule, are not well tolerated, but a small quantity of butter or cream may usually be permitted.

It is highly desirable, however, that the animal and vegetable foods should not be taken together, but certain meals should consist almost wholly of concentrated animal food, and others wholly of carbohydrates or purées of fresh vegetables. Carbohydrates being digested in the small intestine, their presence in the stomach together with animal food only retards the digestion of the latter. If the dilatation depends on stricture of the pylorus, it will be desirable to limit the food entirely, at any rate for a time, to such substances as can be absorbed in the stomach, i.e. to nitrogenous animal foods in fluid form.

It may be desirable, in some severe cases, attended with troublesome vomiting, to adopt for a time a strictly milk diet, giving the milk mixed with crushed ice in small quantities at a time and at suitable intervals. Condensed peptonised milk is warmly praised by Ewald.

Professor Bouchard has rightly insisted on the necessity of keeping the meals as far apart as possible; nine hours, he says, should intervene between breakfast and dinner, and fifteen between dinner and breakfast. We have ourselves no doubt that one reason why dietetic measures fail in some of these cases is that food is allowed to be taken too frequently, gastric digestion being very slow in many of these patients. Dujardin-Beaumetz also insisted that there should be no eating between breakfast at 11 a.m. and dinner at 7.30 p.m.

If the patient complains of faintness with cravings

for food because of these long intervals between meals, he may be allowed to take occasionally a small wine-glassful of meat juice or some other liquid food, such as panopepton or liquid peptonoids.

The best beverage is pure water, but a little red wine, well diluted with water, may be allowed. Tea, certainly during the early part of the treatment, should be wholly forbidden. Subsequently, when digestive power has been to some extent regained, a little unsweetened tea may be occasionally permitted.

Much use may be made, as Ewald points out, of **nutrient enemata** in these cases. They prove an essential aid to the supply of nourishment, and by their help we may for days keep the stomach almost entirely unoccupied. They are specially useful when for any reason lavage of the stomach is impracticable. They also afford a means of supplying water to the system, which is greatly needed.

The following sketch of a dietary for the slighter cases of dilatation of the stomach may prove useful :—

8 A.M., *Breakfast.*—Two poached or lightly boiled eggs, or a small grilled sole flavoured with lemon-juice, 1 oz. of thin toast, followed by 2 to 4 oz. of beverage—water, or hot milk and water (if milk agrees).

1.30 P.M.—A small teacupful of hot water.

2 P.M., *Lunch.*—4 to 6 oz. of boiled rice, or tapioca, or sago, with a little fruit jelly; or macaroni, with a little grated cheese; 4 oz. of water, or weak brandy and water. (A little cream may be used in preparing these.)

7.30 P.M.—A cup of hot water.

8 P.M., *Dinner.*—The lean of a mutton chop; or a slice of the lean of roast or boiled mutton or chicken (about 3 oz.); 1 oz. of purée of potato, 1 oz. of dry toast; 4 oz. of water, or weak brandy and water.

11 P.M.—A tumblerful of Vichy water (made hot).

A cup of milk and water or two or three tablespoonfuls of panopepton may be taken during the night if the need for food be felt.

This dietary admits of obvious variations, in accordance with the principles laid down, and the quantities may be increased as the patient's condition improves.

It is generally advisable to keep the patient *absolutely at rest* when following a restricted diet of this kind.

Kussmaul has advised that the patient should wear an abdominal binder to support the stomach, and should lie on the right side the greater part of the day, so as to promote the escape of food from the dilated stomach. The bandage, especially if accompanied by a light pad, causes more intimate contact of the contents of the stomach with its walls, and consequent increase of movement and secretion.

Before proceeding to apply some such dietary, or to make use of the medicinal means we shall immediately describe, it is undoubtedly desirable to cleanse the stomach of its decomposing contents and morbid secretions; and when the patient objects to this being done with the siphon tube, there are still two other measures, either of which may prove satisfactory.

We may empty the stomach, as recommended by Dr. Hare, by means of an emetic. He used to prescribe 24 grains of powdered ipecacuanha for this purpose with excellent results.* It has, however, been objected to the use of emetics (Leube) "that they never secure a complete expulsion of the fermenting ingesta," and that in advanced cases the loss of muscular tone is so great that it is difficult, if not impossible, to excite vomiting.† In such cases the use of purgatives is certainly preferable, and good results have been obtained by the use of Carlsbad water for this purpose. A glass of the water should be given cold every half-hour, in the morning, fasting, until it causes an action of the bowels. By this means the residue of ingesta is carried off through the pylorus and the Carlsbad water relieves also the coexisting gastric catarrh. It is often necessary to increase the purgative effect of the natural Carlsbad water by adding a teaspoonful of the Carlsbad salts to each glass. We consider this a good plan of treatment in dilatation due simply to atony of the gastric walls, and we have also known instances of organic obstruction greatly

* *Trans.* of Medical Society of London, vol. xi., p. 20.

† Von Ziemssen's "Cyclopædia of the Practice of Medicine," vol. vii., p. 332.

benefited by the Carlsbad course, but this method is not of course applicable to cases of advanced stenosis of the pylorus.

Hyperacidity of the stomach frequently calls for the administration of bismuth salts and alkalis: 15 grains of the carbonate of bismuth may be given with 10 minims of glycerine of carbolic acid and 15 grains of bicarbonate of soda in one ounce of chloroform water; if there is much pain, 10 minims of tincture of opium may be added to each dose. We do not advocate the employment of pepsin with hydrochloric acid, or the giving of bitters, to aid the stomach in its work, on account of this habitual hyperacidity. Only in cases of hypoacidity can we look for benefit from these remedies: then we may give 10 drops of dilute hydrochloric acid after each meal, with 6 or 8 grains of pepsin. If strychnine is employed for the purpose of raising the tone of the gastric muscle, it is best to give it by the hypodermic method. If there are acid eructations or complaints of heart-burn, we may give half a dram of sal-volatile in a wineglass of hot water, and 10 drops of essence of ginger may be added.

Paul Cohnheim has reported a series of observations and experiments to the effect that a number of cases of pyloric stenosis and consequent gastrectasis can be relieved by means of large doses of olive oil. The cases suited to this cure are those of spasm following ulcer or fissure and cicatricial cases. The oil is given at the temperature of the body through a tube, either in doses of 50 c.c. an hour before meals, or in one dose daily of 100 to 150 c.c. He infers that the resistance caused by friction is lessened by the mechanical effect of the oil—that it causes relaxation of spasm and improves nutrition, being absorbed when it reaches the small intestine.

In cases of ulceration the oil acts on the spasm as a narcotic. It does not relieve purely nervous cramp.

He maintains that this method of administering

olive oil will, in many cases, render surgical interference superfluous.

We would point out that the patient, after taking those large doses of oil, should be directed to lie on his right side to favour its outflow from the stomach through the pylorus.

External faradic applications have been stated to be of use in restoring tone to the gastric muscles. It is doubtful, however, if the effect is transmitted to the stomach through the abdominal wall, and we should prefer the general tonic influence of the high frequency current. Massage has likewise been found advantageous, and it seems possible, by this measure, not only to promote the passage out of the stomach of the residue of the food retained there, but also to rouse, to a certain degree, the tone of its muscular walls.*

Constipation, when it exists, must be overcome, either by saline aperients, as Carlsbad water, taken in the manner already described, or by a pill of aloes, soap, and ipecacuanha every night if necessary.

℞ Aloes pulveris ... ... gr. j. ad iij.
Ipecacuanhæ pulveris ... ... gr. ¾.
Saponis ... ... gr. j.
Misce, ut fiat pilula.

Boas prefers enemata to aperient drugs for relieving the bowels.

The usefulness of **antiseptic** agents for the

* Hirschberg ("Massage de l'Abdomen," *Bull. de Thérap.*, 1887, t. cxii., p. 248) recommends the following mode of applying massage in cases of dilatation of the stomach: First, by means of percussion and succussion the lower limit of the dilated organ is marked out, then with the palm of one or of both hands pressure, at first very gentle and afterwards gradually augmented, is made, passing from the left and lower limit towards the pyloric region. Then, placing the ends of the fingers stretched out over the inferior and left boundary of the stomach, light pressure is made with them, passing as before towards the pylorus. The pressure, at first slight, should be progressively increased. After five or six minutes of these manipulations, kneading and compression of the stomach should follow; then, pushing the fingers down as far as possible, we should try to knead gently and lightly the contents of the stomach, pressing at the same time with the hands from below upwards and from left to right.

purpose of preventing putrid decomposition of the contents of the stomach is now widely recognised.

Pills of creasote, thymol, menthol, or carbolic acid, or capsules of cyllin (3 minims), taken immediately after food, or sulphurous acid in dram doses, or salicylate of soda in doses of 15 grains, or salicylate of bismuth (℞ Bismuthi salicylatis, magnesii carb., āā 5 grains; m. f. pulv.; to be taken after each meal), or chloroform water may be given both for their sedative and their antiseptic effects.

Sir Wm. Broadbent recommends sodium sulphite in 5- to 10-grain doses, with sodium bicarbonate and nux vomica between meals when the gas eructated has the odour of sulphuretted hydrogen. He also speaks highly of a mixture of sodium sulpho-carbolate in doses of 5 to 10 grains with sodium bicarbonate, spirits of ammonia, and gentian—we prefer chloroform water to gentian—given at a certain interval after meals. He has found benefit arise from the use of a pill composed of $\frac{1}{24}$ grain of perchloride of mercury, $\frac{1}{24}$ grain of strychnine, and 1 minim of creasote taken between meals.

An important adjunct to these other measures is regular exercise in the open air—preferably the air of the country; gentle gymnastic exercises are also useful, and the circular douche applied to the region of the stomach, the spinal douche, and other tonic hydrotherapeutic treatment, by raising the general tone of the nervous and muscular systems, will often prove of great assistance in treating these cases.

We now approach the consideration of the mode of treating dilatation of the stomach so strongly advocated by Kussmaul and Leube, and adopted by many other physicians, viz. the mechanical emptying and **washing out** the stomach by the stomach pump or siphon tube. Leube says: "With the introduction of this practice the treatment of dilatation of the stomach has for the first time become a rational one, and all other remedies sink by comparison into the second and third rank"; and Ewald says: "The

advantages resulting from this method are evident, and the only wonder is that it was not made use of earlier." This radical measure, when it is well tolerated by the patient, is no doubt one of the most efficacious of curative processes, but it is intolerably repugnant to many. Ebstein* has applied this method even to infants under a year old, using a No. 8 to 10 Nélaton's catheter, and washing the stomach out with warm water containing a little benzoate of magnesia.

Plain warm water or water containing a little borax in solution may be used. Some use the stomach pump at first when the contents of the stomach are "bulky and lumpy." The siphon tube can be employed later, and may be managed by the patient himself.

Leube prefers the stomach pump, and does not approve of the patient being left to wash out his own stomach. "The siphon has the disadvantage that it can withdraw from the stomach only fluids, or substances which are very nearly fluid, and resort must be had to the pump to remove the remnants of the ingesta . . . and the removal of the ingesta to the fullest extent possible is altogether the most important indication. . . . The operation of washing out the stomach when entrusted to the patient alone is attended with so many risks from his unavoidably awkward movements in connection with the protrusion of the lower wall of the stomach by the end of the tube, that I cannot but regard the relegation of the operation to the patient himself as extremely hazardous."†

When, however, the stomach tube is made of soft rubber, as in the instrument to be described, there is no danger of the patient injuring himself, and the simplicity of the siphon arrangement has much to recommend it, although no doubt the washing out of

* *Arch. für Kinderheilkunde*, Bd. iv., S. 325.

† Leube on Diseases of the Stomach, in von Ziemssen's "Cyclopædia of the Practice of Medicine," vol. xi., p. 328.

the stomach is not so complete as with the stomach pump, and it may be advisable occasionally to commence with the latter instrument.

The **stomach siphon,** as described by Faucher, consists of a soft rubber tube not less than 50 or 60 inches in length provided with a projecting index to show to what depth it should be allowed to pass

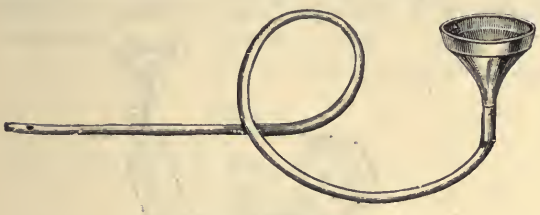

Fig. 1.—Stomach siphon.

down into the stomach. These tubes can be obtained of three sizes (Nos. 1, 2, and 3), having respectively a diameter of 8, 10, and 12 millimetres. A glass funnel is fitted to its outer end. Debove's modification is somewhat less supple and more resistant, so that

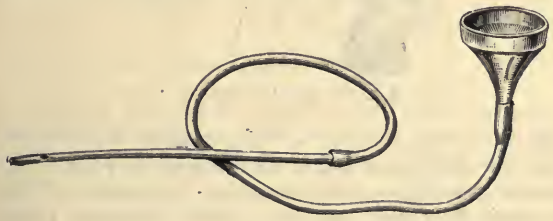

Fig. 2.—Stomach siphon (Debove's modification).

it can be pushed more easily down the œsophagus and into the stomach.

In first using the stomach tube it is best to begin with the smaller size, and when the patient is accustomed to its use to employ the larger ones. The tube should always be submitted to rigid antiseptic cleansing before and after use. Any false teeth are better

removed. The tube is introduced into the pharynx in the same manner as an œsophageal bougie; you then direct the patient to make efforts at swallowing as you push the tube down into the œsophagus.* The tube should be warmed and smeared with glycerine before passing. When the tube has passed as far as the index marked on it, you affix the funnel to the outer end, and fill it with the fluid you wish to introduce

Fig. 3.—Mode of using stomach siphon.

into the stomach (Fig. 3); the moment you observe that the fluid has nearly disappeared you lower the funnel rapidly, and the liquid contents of the stomach flow out into the vessel you have placed to receive them (Fig. 4).

Sometimes difficulty occurs in the introduction of the tube owing to its provoking nausea, or efforts at vomiting, or even attacks of dyspnœa. This is especially the case in persons with great irritability

* Most patients prefer the soft though larger tube of Faucher, which is passed rapidly into the œsophagus *with the chin depressed*. Rosenheim uses a tube with several lateral openings as well as a terminal one.

of the fauces and pharynx: in such persons it is best to paint these parts with a 5 per cent. solution of chlorhydride of cocaine about ten minutes before attempting to introduce the siphon. Preliminary gargling with a table-salt solution is sometimes sufficient. Toleration of the presence of the tube in the pharynx and œsophagus is, however, rapidly established, and the patient may after a few days be encouraged to pass the tube himself.

It is usual to employ some slightly alkaline water

Fig. 4.—Mode of using stomach siphon.

for washing out the stomach—warm water containing about 2 grains to the ounce of sodium bicarbonate is the best. Sometimes it is desirable to use an antiseptic fluid, such as a saturated solution of boric acid, or creasote water, or a 1 per cent. solution of sodium salicylate, or sodium sulpho-carbolate, or lysol; or some tincture of myrrh may be added to the water in cases of atonic dyspepsia. If there is complaint of pain in the stomach, you may mix some subnitrate of bismuth with the water put into the funnel, and allow it time to deposit itself on the mucous membrane of the stomach, or you may use chloroform water (2 per cent.) with the bismuth, and this has both an anæsthetic and an antiseptic action. As to

the quantity of fluid to be used at each washing, this will depend on the tolerance of the patient, and more than two quarts is seldom needed; but, if possible, washing-out should be continued until the fluid that flows out is as clear and pure as that which is flowing in.

Occasionally the outflow of fluid suddenly ceases, especially if the tube has only one opening at its gastric extremity (it should have two or more, placed laterally), owing to this opening becoming blocked by particles of food; these can usually be washed away by allowing some more fluid to flow into the stomach. Sometimes the opening of the tube in the stomach may not be in contact with its liquid contents; this may occur when the dilatation is very great, and the tube fails to reach the contents; or if too much of the tube has been introduced it may bend on itself, and the opening may thus reach the upper and empty part of the stomach. A little manipulation of the tube, or the use of a longer one, will usually surmount either of these difficulties. In severe cases of dilatation of the stomach, lavage will be necessary once a day. Possibly the best hour is shortly before the patient settles down for the night's rest: the complete cleansing of the stomach promotes restful sleep. As, however, the morning is usually more convenient, it is not uncommonly carried out some three hours after a light and early breakfast. In rare cases of decomposition of the gastric contents with great fœtor, lavage may be necessary for a short period both night and morning. As the symptoms improve, the number of washings per week may be gradually diminished, and finally discontinued.

The siphon, however, will not suffice, as Leube has stated, for all cases. In cases of malignant stricture of the pylorus, with enormous distension of the stomach with putrid substances, the stomach pump will often be necessary adequately to cleanse its cavity.

Another method of employing the siphon tube, devised by Rosenthal, is shown in the accompanying illustration (Fig. 5).

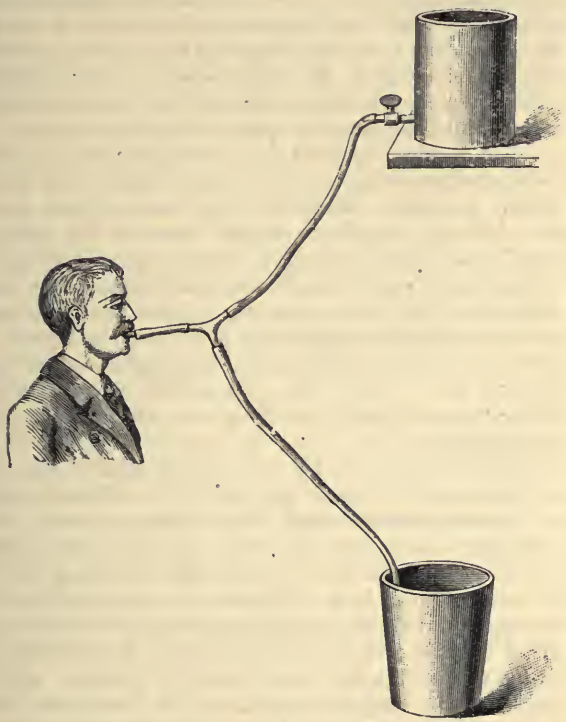

Fig. 5.—Stomach tube and irrigator.

To the outer end of the stomach tube is fixed a Y-shaped glass tube, one branch of which is connected with an elastic tube running to an irrigator containing the fluid to be introduced into the stomach, and standing at some height above the patient's head; the other branch is connected with the outflow tube, which descends to a suitable receptacle. Fluid runs

into the stomach through the tube connected with the irrigator, the outflow tube being compressed by the fingers of the left hand. If the outflow tube be kept open while the fluid is flowing from the irrigator, and if then, after the establishment of a column of water in the outflow tube, the irrigating tube be compressed with the fingers of the right hand, or its stopcock closed, a siphon communicating with the stomach is formed, and empties this organ of its fluid contents.

The results obtained from the application of the method of washing out the stomach vary in different cases. In some immediate relief and ultimate cure are observed; in others we find more or less speedy relief and apparent cure, but frequent relapses, requiring reapplication of the treatment; there are other cases in which recovery is slow and gradual, and the treatment necessarily prolonged and tedious; others in which benefit attends the application of the method but it has to be continued for the remainder of the patient's life; and others in which no benefit is obtained.

It must also be borne in mind that there are certain cases in which the use of the stomach tube is **counter-indicated**—for instance, when the attempt to introduce it causes so much pharyngeal spasm or distress from nausea and vomiting as to be seriously injurious to the patient; the existence of a seriously diseased heart or advanced phthisis, or of great debility; the recent occurrence of hæmorrhage from the stomach; most cases of gastric ulcer; cancer of the cardiac orifice, or of the œsophagus, and aneurysm of the aorta. In all these circumstances we must have recourse to those other methods of treatment already detailed.

If diligent lavage, combined with gastric antiseptics and an appropriate dietary, fails to relieve the symptoms of dilatation, the case is probably one that needs relief by operative measures.* We must

* Mayo Robson, "The Surgery of the Stomach," *Lancet*, March 17, 1900, p. 755.

therefore in conclusion consider, very briefly, the **surgical** measures that have been proposed for the relief of this condition.

If the dilatation is dependent on adhesions around the pylorus of a simple kind and such as can be detached—and this, of course, can only be determined by an exploratory operation—the setting free of the pylorus by their detachment may effect a cure.

If, however, an exploratory operation discloses the fact that there is pyloric *stenosis*, this may be dealt with according to the nature of the stricture.

Loreta's operation of forcible dilatation of the pylorus in cases of spasm, or hypertrophy of the circular muscular fibres, although it appears to have succeeded well in his hands, has not been so favourably regarded by English surgeons, and Mayo Robson "decidedly" prefers "pyloroplasty where no active ulceration is going on, and gastro-enterostomy where the pylorus is ulcerated."

Pyloroplasty consists in dividing the narrowed pylorus longitudinally and closing the wound transversely. Mayo Robson uses a decalcified bone bobbin, which seems to facilitate the operation, and serves to maintain an open channel. In cases of "bad organic stricture" this authority advises pyloroplasty together with "partial excision."

If the surgeon should find "firm adhesions, active ulceration, and the presence of new growth," gastro-enterostomy may be the better operation.

In some cases of stenosis from malignant growth, "if the growth be limited and there is no secondary infection," pylorectomy may be indicated.

Sir W. Bennett believes that in many cases of gastric dilatation this condition is due to spasmodic contraction of the pyloric sphincter, and that the appropriate treatment is to open the stomach on the cardiac side of the pylorus and forcibly stretch the contracted sphincter "until it will allow two or three fingers to lie loosely in it." This measure, he thinks, "should be adopted before the stomach walls have

undergone degenerative changes which may render their return to a healthy state impossible." *

As to the value of the operations of gastrorrhaphy or gastroplication employed for the reduction of a dilated stomach to something like its normal capacity, there has not been, up to the present, sufficient experience in this country to justify the expression of a positive opinion. Mayo Robson and Moynihan think the "reports show that the operation is a most beneficial one if the cases be well selected."†

ADDITIONAL FORMULÆ

For distension and discomfort in early gastric dilatation

℞ Sodii sulpho-carbolici, gr. v. ad x.
Sodii bicarbonatis, gr. xv.
Sp. ammon. arom., ʒss.
Tincturæ gentianæ co., ʒss.
Aquæ chloroformi ad ℥j.
M. f. haust. To be taken an hour or two after meals.
(*Broadbent.*)

Morning draught in the same cases

℞ Sodii phosphatis, ʒj ad ʒij.
Succi taraxaci, ʒj ad ʒij.
Aquæ ad ℥j.
M. f. haust. To be taken in hot water early in the morning.
(*Broadbent.*)

* *Brit. Med. Journ.*, Feb. 3, 1900.

† "Diseases of the Stomach and their Surgical Treatment," p. 218.

CHAPTER VI

TREATMENT OF DISEASES OF THE STOMACH: HÆMATEMESIS, VOMITING, AND GASTRALGIA

HÆMATEMESIS: Causes — Symptoms — Diagnosis — *Treatment* — Prophylaxis — Complete Rest—Morphine—Cold—Syncope—Saline Infusions—Suprarenal Extract — Styptics — Gelatin Solution—Calcium Chloride—Aperients—Tonics.

VOMITING: Its Nature—Prevention—Pathology of Gastric Irritability—*Treatment*—Sedatives—Local Remedies. Sea-sickness—Diet—Posture—Drugs. Vomiting of Pregnancy—Rest—Food—Drugs—Evacution of Uterus.

GASTRALGIA, OR GASTRIC NEUROSIS: Its Causes, Diagnosis, and Symptoms—*Treatment*—Anæmic, Malarial, Hysterical and Gouty Forms—Treatment of Paroxysm—Drugs—Local Applications.

Additional Formulæ.

HÆMATEMESIS

IN considering the treatment of gastric ulcer and gastric cancer we have had to remark the frequent occurrence of hæmorrhage from the stomach in these diseases. There are many other conditions which may cause the effusion of blood into the cavity of the stomach, and it is the occurrence and treatment of gastric hæmorrhage from these other conditions, and in a general sense, that must now occupy our attention.

One of the most common causes of escape of blood into the stomach is venous congestion of its mucous membrane from obstruction to the circulation through the liver, especially from cirrhosis of that organ leading to compression of the branches of the portal vein. Any other obstruction to the circulation in the portal vein will produce a like effect. It is sometimes associated with enlargement of the spleen.

Increased pressure in the portal system from arrest of a regularly recurring hæmorrhoidal flux is sometimes attended with hæmatemesis.

Hæmorrhage into the stomach may occur from lesions of its vessels, or from a morbid permeability of the vascular walls, together with a morbid state of the blood, as in the so-called hæmorrhagic diathesis (hæmophilia), in malaria, in scurvy, in yellow fever, and some other affections; or the bleeding vessel may be at the lower part of the œsophagus, from the existence of a dilated and varicose condition of the veins there, a not uncommon development in hepatic cirrhosis, by means of which a collateral circulation is established, allowing the blood from the portal vein to reach the heart without passing through the liver, and the blood thus extravasated may flow into the stomach and accumulate there; or it may flow back into the stomach from the duodenum; or an aneurysm of an adjacent artery may rupture into the stomach.

We have seen how hæmorrhage into the stomach may be produced by erosion of its vessels from simple or cancerous ulceration; and erosion from the entrance of corrosive substances, or rupture of vessels from mechanical injury, will, of course, be attended with the same results. Violent acts of vomiting sometimes lead to hæmorrhage. In some cases of severe and fatal hæmorrhage from the stomach it has been found impossible, on post-mortem examination, to discover the source of the bleeding; it must have been wholly capillary and congestive.

Hale White has described a condition of profuse gastric hæmorrhage in young women, to which he assigns the name *gastrostaxis*. The condition closely resembles the hæmorrhage from acute gastric ulcer in its clinical manifestations, but post mortem there is no evidence of any lesion of the stomach. There is no special relation of the bleeding to the time of the menses.

Some of these mysterious cases of capillary hæmorrhage have been found to occur after certain surgical operations—especially operations connected

with the abdominal cavity and the omentum. Mayo Robson remarks that these cases are "neither well recognised nor well understood," yet they are "often serious, and at times fatal." *

In the female sex, the occurrence of menstrual irregularities seems to exert an important influence on the frequency of the occurrence of gastric hæmorrhage.

The **symptoms** which reveal the occurrence of hæmorrhage into the stomach are the following: In the first place, there is usually vomiting of blood, but this symptom may be absent, and a small quantity of blood extravasated into the stomach may pass away by the bowels; when a large quantity of blood has been rapidly poured out, certain symptoms may precede the actual vomiting of blood, such as a sense of weight, fullness, and warmth in the epigastrium, accompanied by nausea, an unpleasant, sweetish taste in the mouth, and a feeling as of fluid rising in the œsophagus. As the hæmorrhage goes on the patient becomes pale, and complains of giddiness and faintness, of noises in the ears, and sparks of light in the eyes. The pulse is small and rapid, and the skin cold.

These symptoms may, however, be absent in smaller hæmorrhages and in robust persons. The blood vomited passes through the mouth, and sometimes through the nose, and is partly fluid, partly clotted; a portion may enter the larynx and excite coughing, and this must be borne in mind when the hæmorrhage is said to have been attended by coughing. There are occasionally cases of large hæmorrhage in which the blood is retained in the stomach and not vomited, and percussion over that organ shows that it is distended and dull from the presence of blood clot, while the general symptoms of severe internal hæmorrhage are present, such as pallor and coldness of the surface, collapse, pulselessness, tremors, and

* Hunterian Lectures on "The Surgery of the Stomach," *Lancet*, March 10, 1900, p. 679.

convulsions. Sooner or later, after the hæmorrhage, blood appears in the motions, usually in the form of a black, tar-like substance.

The appearances presented by the blood vomited depend on the amount of hæmorrhage and on the time it has been detained in the stomach. If vomiting occurs at once, the blood may be of a bright-red colour and entirely fluid, but more commonly it is partly coagulated, and has the appearance of coffee-grounds or of soot mixed with water, the change in colour being due to the action of the gastric juice on the hæmoglobin. Sometimes portions of food, bile, and mucus may be mixed with the altered blood.

The usual symptoms of anæmia follow the loss of blood if it has been large: great pallor, coldness of the extremities, giddiness and faintness, spots before the eyes, and other affections of vision.

The alarming symptoms of gastric hæmorrhage usually pass away, and the patient recovers; and in cases of cirrhosis of the liver some of the symptoms of the original disease have, occasionally, been ameliorated by its occurrence.

But if it recurs, as it is prone to do, frequently and in large amount, the patient must, of course, ultimately sink from exhaustion, if he does not die suddenly during an attack.

A few considerations as to **diagnosis** are necessary before we enter upon the discussion of the treatment applicable to these cases. There is usually little difficulty in deciding as to the source of the hæmorrhage when we have been familiar for some time with the previous history of the patient. The difficulty arises chiefly in those cases in which a loss of blood occurs suddenly and unexpectedly in a person who has not been recently under medical supervision.

This may occur sometimes in cases of ulcer of the stomach, or in those cases of hæmorrhage from the stomach or lungs associated with menstrual irregularities; and in cases of early unsuspected

phthisis. We must also bear in mind that blood is sometimes intentionally swallowed, and that it may be so, accidentally, when poured out from the mucous membrane of the nose, pharynx, or even the air passages during sleep.

We may conclude that the blood proceeds from the stomach in the following circumstances: The bringing up of the blood is preceded by nausea and an inclination to vomit; it is of dark colour (unless very considerable in quantity, when it may be bright); it is coagulated, contains no air bubbles, may be mixed with food, and has an acid reaction. It is followed by tar-like motions. It is not followed by the coughing up of blood-stained expectoration, nor are there any localised moist râles or any area of loss of resonance to be discovered in the lungs.

The **indications for treatment** in cases of hæmatemesis must necessarily depend on the nature of the original disease of which it is but a symptom. Many of these diseases are incurable, as will be evident in referring to what has been said under the head of causation; and when hæmatemesis occurs in the course of gastric cancer, or of chronic disease of the liver, heart, or lungs, it is only as an incident in the course of these affections that its treatment has to be considered. The treatment appropriate to gastric ulcer generally we have already discussed.

In certain cases the opportunity of applying prophylactic measures may occasionally be afforded. If gastric hæmorrhage tends to occur at the menstrual period, all physical exertion at the approach of and during the catamenial period should be strictly forbidden; if it is known to be dependent on hepatic cirrhosis, leeches may be applied to the anus so as to withdraw blood from the hæmorrhoidal veins; in chlorotic and scorbutic persons the general health should be strengthened by iron tonics and a hygienic regimen; and certain periodically returning attacks associated with malaria have been permanently arrested by the administration of quinine.

When hæmorrhage has actually occurred, the paramount indication is to diminish vascular pressure so far as possible. Fortunately, the escape of blood itself tends to do this, especially when it causes syncope, so that it has become an axiom that hæmorrhage tends to cure itself. In order, then, to quiet the action of the heart as much as possible, the most complete rest in the recumbent position should be insisted upon and maintained: the urine and fæces must be passed in this position. If the patient should have fainted on the occurrence of the hæmorrhage, he should not be moved, but treated where he is found, so that absolute rest may be maintained, at any rate, for some hours. The patient's anxiety should be calmed, and his room kept cool and quiet. No food should be given by the stomach for several days, that organ being kept quite at rest so as to avoid the risk of dislodging the fibrinous plugs in the bleeding vessels. Such nutriment as is needed must be given by the rectum: care must be taken not to move the patient during administration of the enemata. (*See* Rectal Feeding, p. 42.)

A hypodermic injection of morphine or a small opiate enema should be given at once; it lowers vascular tension, soothes the patient, relieves pain, and contributes to mental and bodily rest.

The local application of cold is usually an efficacious remedy. An ice-bag, suspended from a cradle, may rest lightly on the epigastrium, or ice pounded and mixed with bread-crumbs may be applied in the form of a poultice.

Syncope may be relieved by the horizontal position, the head being kept low by raising the foot of the bed. Smelling salts may be applied to the nostrils, and cold water sprinkled on the face, and the temples bathed with eau-de-Cologne. When the syncope is dangerous, one of the best measures to have recourse to is the hypodermic injection of ether, 20 or 30 minims at a time, repeated at short

intervals ; or strychnine and ether combined may be used.

Giving stimulants by the stomach should, if possible, be avoided.

In cases where life is endangered by the profuseness of the hæmorrhage, and the consequent dangerous fall of blood-pressure, it is desirable at once to increase the fluid of the circulation by means of saline infusions—a teaspoonful of common salt to a pint of water boiled and cooled to 100° F. This is allowed to flow slowly, by its own weight, through a Southey's tube attached by indiarubber tubing to a funnel, into the loose tissue of the axillæ or inner side of the thighs. If symptoms are urgent, two Southey's tubes can be attached at the same time by means of a Y-shaped glass tube, so as to provide two simultaneous supplies, one into each axilla or thigh. There is, however, a risk incidental to replacing the fluid too rapidly, in the likelihood of washing away the newly-formed coagulum from the mouth of a ruptured vessel, and renewing hæmorrhage. This fact seems to us a most cogent objection to direct transfusion into the veins. When no infusion apparatus is handy, the saline solution should be introduced by a high tube into the rectum, whence, if retained, it will be completely absorbed.

But what means are there at our disposal for arresting the bleeding when it continues or recurs at short intervals?

The administration of some active suprarenal extract is the most powerful means we have of exerting a local styptic effect. The 1-in-1,000 solution of adrenalin chloride (Parke, Davis & Co.) is a satisfactory preparation : 20 drops in a dessertspoonful of water may be given every two or three hours. Soltau Fenwick recommends a decoction of tabloids of suprarenal gland, of a strength of 5 grains to the ounce of water, and of this he gives 2 ounces or more every two or three hours.

Of other styptics, ferric perchloride, lead acetate,

tannin, alum, turpentine, all have their advocates, and may be appropriately employed in recurrent hæmorrhages of a slight character. In such a condition the following mixture may be prescribed: —

℞ Plumbi acetatis ... ... ʒss.
Acidi acetici diluti ... ... ʒij.
Liquoris opii sedativi ... ... ʒss.
Aquæ caryophylli ... ... ad ℥vj.
Misce, fiat mistura. A tablespoonful every hour.

But if hæmorrhage of this kind persists, the advisability of surgical treatment must always be considered.

We must be careful in administering astringents not to excite constipation, which tends to raise the blood-pressure. A few grains of calomel will prove a useful initial aperient, and if constipation persists, relief must be obtained by enemata.

Some advise, in severe hæmorrhage, the intramuscular injection of gelatin dissolved in normal salt solution (containing 2 per cent. of gelatin). A single injection of 200 c.c. may be given, and repeated if necessary in the course of two or three days.

Calcium chloride deserves a trial in obstinate cases. If rectal injections of warm water are being given for relief of thirst a dram may be added to each enema.

If there is a troublesome tendency to vomit, sinapisms may be applied to the epigastrium, and 3 or 4 minims of dilute hydrocyanic acid in a tablespoonful of iced water may be given every hour or two for four or five times. A small quantity of iced champagne is occasionally useful in checking the vomiting.

In those remarkable and ill-understood cases mentioned by Mayo Robson of capillary hæmorrhage from the stomach following certain operations, he advises free purgation by calomel and wholly rectal alimentation.

In cases of cirrhosis of the liver the *after-treatment*, i.e. after the hæmorrhage has ceased, should

include the daily use of an aperient composed of the alkaline sulphates; this will tend to relieve, or prevent, engorgement of the portal system.

℞ Sodii sulphatis ... ... ʒj ad ʒij.
Magnesii sulphatis ... ... ʒss ad ʒj.
Aquæ cinnamomi ... ... ʒjss.
Misce, fiat haustus. To be taken early in the morning.

The resumption of feeding by the stomach must be attempted with great caution, and nothing but fluid and non-irritating foods administered for some considerable time.

Restorative blood tonics will be needed in many cases to remove the anæmic condition consequent on the loss of blood.

Vomiting

Vomiting is, as we have seen, a symptom common at some time or other to most diseases of the stomach, and it occurs also in a number of other diseases, e.g. in whooping-cough, in phthisis, in renal disease, in uterine and ovarian disease, in meningitis, in cerebral tumour, in hysteria, in intestinal obstruction, etc., and its appropriate treatment as a symptom of these several maladies must necessarily be considered when we discuss the treatment of the diseases themselves. But vomiting also not infrequently occurs as a morbid phenomenon occupying by itself almost the whole of the stage, so to speak; as, for instance, in sea-sickness; and it will be convenient and profitable here to consider briefly its treatment in a general sense, and as it occurs unconnected with any definite pathological lesion.

The **act of vomiting**, whether the irritation causing it be central or peripheral, consists in deep inspiration with spasm of the diaphragm and closure of the glottis, followed by opening of the cardiac orifice of the stomach, with violent contraction of the abdominal muscles and some contraction of the stomach, so that its contents are more or less forcibly ejected.

Threatened vomiting from irritating ingesta can often be prevented by simply diluting the irritating contents of the stomach with water, when there is no actual disease of the stomach present. In such cases certain kinds of food or drink, accidentally or incautiously taken, remain in the stomach an unusually long time, and provoke a great amount of acid fermentation. In the circumstances the pylorus contracts spasmodically so as to prevent the passage into the small intestine of this highly acid or imperfectly formed chyme; two or three glasses of pure water, or, better still, water containing 10 or 15 grains of sodium bicarbonate in each glass, will entirely remove the tendency to vomit in such cases, and it would seem that when this excessive acidity of the gastric contents is diluted, or neutralised, the pylorus relaxes, and allows the contents of the stomach to pass on into the small intestine. If these simple measures fail to give complete relief, we may consider the desirability of washing out the stomach.

Care and observation in diet will usually suffice to cure this tendency to vomit, which is dependent on an abnormal irritability of the stomach to certain ingesta. Iced drinks and effervescing alkaline waters are often of much use in such cases.

In cases of simple gastric irritability the food may be limited to a mixture of milk, ice, and Apollinaris or Vichy water for a time; and this should be sucked through a straw or a glass pipette: in addition, an ordinary effervescing mixture, with excess of alkali, may be prescribed.

We have found 20 grains of sodium bromide dissolved in an ounce and a half of dill-water, taken an hour before a meal, check or arrest the tendency to irritative vomiting in some neurotic persons. Feeding by the rectum is difficult in these cases of gastric irritability occurring in nervous persons, as the repeated efforts at vomiting are often attended by involuntary expulsion of the nutrient enemata.

In urgent cases of vomiting the patient should be

put to bed so as to secure absolute repose. If practicable, an initial catharsis with a few grains of calomel should be secured. All food must be withheld by mouth, and thirst relieved by injections of warm water into the bowel, and rinsing the mouth with some simple cleansing mouth wash: 5 or 6 drops of odol in a couple of ounces of water is very serviceable for this purpose. It may be necessary to resort to the use of morphine, either hypodermically or in the form of suppository, but we must remember that in some subjects morphine itself is liable to excite vomiting. As vomiting subsides we may return cautiously to feeding by the mouth, giving at first the smallest amounts of unirritating fluid food, such as milk and soda water or lime water, albumin water with the addition of a little brandy, and the like.

The pathology of these states of temporary or recurring gastric irritability, in the absence of any disease, is somewhat obscure, but they are probably, in many instances, states of **hyperæsthesia** of the gastric mucous membrane analogous to those forms of cutaneous hyperæsthesia which occur in localised areas of skin in some hysterical persons, or to those cases of irritability of the vesical mucous membrane, with frequent micturition, which we often encounter. But this condition of stomach calls much more urgently for treatment than those other hyperæsthetic states to which we have alluded, for in the latter the nutrition and general health of the patient are not endangered as they are in the former. It is, therefore, not only justifiable, but necessary, to apply anæsthetic remedies freely in severe cases until the irritability of the gastric mucous membrane is overcome. It may be necessary, as we have said, to have recourse to opiate and belladonna suppositories or to hypodermic injections of morphine and atropine, or to the internal administration of cocaine, chloroform water, or other sedatives.

Before, however, resorting to these, we should try the effect of more simple measures. Lime water has

often a remarkably sedative effect on the gastric mucous membrane, and we should never omit the trial of tablespoonful doses of lime water every hour or two. Cherry-laurel water or hydrocyanic acid is also most useful, and the latter would succeed more frequently than it does were an adequate dose given. In cases of extreme irritability we should begin by giving 3-minim doses of the dilute hydrocyanic acid of the B.P., and increase the dose to 6 or 8 minims, watching carefully the effect of the remedy. We have known larger doses than this given with remarkable success; but such large doses of a poisonous agent must only be given by, or in the presence of, a medical man.

Chloroform, 3 drops in a dessertspoonful of iced water, is sometimes an effectual remedy.

Whatever medicines we employ, we must bear in mind the liability of the stomach to reject them, and confine ourselves to those of smallest bulk and to the least possible dilution. In some cases we shall be driven to subcutaneous or rectal administration.

Mustard plasters or blisters to the epigastrium or opium plasters have been advocated, and are all worthy of trial in troublesome cases.

Another remedy which will succeed in arresting vomiting in some cases is creasote water, or creasote and lime water—a minim of creasote shaken up with an ounce of lime water; or the creasote may be given in the form of pills made with powdered soap.

Carbolic acid and its derivative, resorcin, have both been warmly advocated as remedies for vomiting, and they act, doubtless, in the same way as creasote. The former may be given in 2-grain doses frequently repeated, made into a pill with liquorice powder; and resorcin in 5-grain doses, well diluted with water and flavoured with syrup of orange-peel. It is said to be valuable in sea-sickness. Menthol is also useful; it can be prescribed in the form of tablets, each of $\frac{1}{10}$ grain, combined with chocolate. Two of these may be taken frequently. These remedies

all possess marked anti-parasitic and anti-fermentive properties, and they are also powerful sedatives.

Creasote and carbolic acid have been prescribed in the following forms for the relief of vomiting :—

℞ Creasoti ... . ♏x.
Acidi acetici ... ... ♏xx.
Morphinæ sulphatis ... ... gr. ss.
Aquæ ... ... ad ℥j.

Misce, fiat mistura. A teaspoonful every half-hour for three or four doses.

℞ Acidi carbolici ... ... gr. j.
Chloroformi ... ... ♏iv.
Spiritus vini rectificati ... ... ℥ss.
Aquæ ... ... ad ℥j.

Misce, fiat mistura. Half to be taken immediately and repeated in half an hour.

Many of the remedies we have here indicated are efficacious in checking the symptomatic vomiting of cerebral, renal, and other maladies.

In the relief of post-anæsthetic vomiting we know no more effectual remedy than to encourage the vomiting by drinking copious draughts of a warm alkaline water—two teaspoonfuls of bicarbonate of soda to the pint of water. The rejection of each draught soon after it is swallowed seems to remove the toxic irritant from the walls of the stomach. This will usually check in an hour or two vomiting and nausea that are apt, if unrelieved, to continue for four-and-twenty hours.

Max Einhorn states that he has seen many cases of "nervous vomiting," which had continued for many years in spite of various modes of treatment, "perfectly cured by the faradic current." *

We may now refer especially to two forms of sickness which we shall have no other opportunity of alluding to, namely, sea-sickness and the vomiting of pregnancy.

And first, with regard to **sea-sickness.** We doubt if anything can prevent sea-sickness (except in

* "Diseases of Stomach" (2nd edit.), p. 444.

short voyages) in certain persons and in certain circumstances, but we are satisfied that much of the distressing nausea and retching which follow the first or second act of vomiting can be, in most persons, effectually relieved, the indication being, after the stomach has been evacuated, to allay the hyperæsthesia of the gastric mucous membrane.

It is undoubtedly of great importance to follow a careful and simple diet for a week or two before undertaking a sea-voyage, and to take two or three doses of aperient medicine during the same period before embarking. A purin-free diet has been specially recommended.

If the inclination to vomiting is but slight, it is unquestionably best to remain in the fresh air on deck, carefully guarded from chill. But for inveterate sufferers it is well to seek recumbency before the vessel starts. It is best to remove all pillows, so that the head may be as low as the body, and on no account should the head be raised. Many instinctively assume a prone posture, finding relief from support of the epigastrium. A tightly applied abdominal belt has been advocated as a useful preventive of sea-sickness, but it has proved of little remedial efficacy in severe cases and on long voyages. In the matter of food each must be a law to himself; speaking generally, the slighter sufferers do best to take a light meal before starting, while those who suffer more severely find their only hope in emptiness of the stomach.

For voyages of five to ten hours, immunity from sickness may be obtained by taking a sufficient dose of chloral and ammonium bromide to procure five to ten hours' sleep; 30 grains of each of these in an ounce of chloroform water should be taken half an hour before the vessel starts (in which a comfortable sleeping berth should be secured). Chloretone, two doses of 10 grains each in capsule, the first one hour before starting, the second on starting, is preferred by some. Certain persons have a tendency to vomit

even in taking long railway journeys, particularly if seated with the back to the engine; potassium bromide will often prevent this tendency.

In short but stormy passages we have found the following draught very useful, and although it may fail to prevent the first act of vomiting and the discharge of the contents of the stomach, it has had the effect of taking away much of the distress of this vomiting, and has proved of great value in preventing further nausea and retching. The draught consists of half a grain of cocaine hydrochloride, 20 minims of chloroform, and a dram of compound tincture of cardamoms, mixed with an ounce and a half of water. It should be given as soon as any serious nausea is felt, and although it will not probably, as we have said, prevent the first act of vomiting, it will, if another dose be taken immediately after this, prevent in many persons a recurrence of the sickness.

There is a considerable amount of evidence in favour of the usefulness of chloral in combating sea-sickness. Dr. Giraldès and Dr. Obet, both quoted by Dujardin-Beaumetz,* bear testimony to its success —the former in his own person in short passages across the English Channel, and the other in his practice as physician to the Transatlantic Company— in doses of 15 to 45 grains—iced champagne being given at the same time to allay thirst.

In those exceptionally grave cases in which the vomiting persists in spite of chloral and other measures, we should not hesitate in the free use of morphine and atropine, injected hypodermically; it is only by such means that the risk of fatal exhaustion can be averted. We should begin with a quarter of a grain of morphine and $\frac{1}{120}$ grain of atropine, and, if necessary, increase the morphine to doses of half, three-quarters, or even a whole grain. Iced champagne or brandy and soda-water should be given if it can be retained; if not, it is advisable during

* "Leçons de Clinique Thérapeutique," vol. i., p. 460.

the continuance of the morphine sleep to administer enemata of milk and brandy or beef-tea and brandy.

There are, however, some persons in whom morphine itself excites troublesome vomiting as well as great cardiac depression, and in such cases we must avoid this drug and have recourse to cocaine or chloroform. One or two drops of the latter on a lump of sugar, or in a wineglass of iced soda-water, may be given every fifteen minutes until the sickness is relieved; or a solution of hydrochloride of cocaine in the proportion of 1 grain to the ounce may be given cautiously in doses of one or two teaspoonfuls every hour or two.

Pills and granules of hyoscyamine sulphate, $\frac{1}{100}$ grain, are frequently used for sea-sickness. Three should be taken during the twenty-four hours before starting, and in short voyages one hourly for the first three hours. For longer voyages the rate of three in twenty-four hours should be adopted for the first few days.

Ammonium bromide is regarded by some ship surgeons as the best of all remedies. It should be begun a day or two before embarking; a dose of 20 grains in an ounce of chloroform water with 15 grains of sodium bicarbonate twice or three times a day. It will remove acidity and promote gastric anæsthesia.

Chlorobrom, which is a mixture of chloralamide and potassium bromide, 30 grains of each to the ounce, flavoured and coloured, has been found of value in the treatment of this malady. The dose is 2 to 4 drams, repeated if necessary.

Other remedies that have been suggested are drop doses of tincture of iodine in a teaspoonful of water every half-hour. Resorcin in 5- to 10-grain doses, and amyl nitrite in doses of $\frac{1}{2}$ minim, dissolved in 20 drops of spirit of wine, and mixed with a teaspoonful of water, every hour.

Oxalate of cerium will occasionally succeed in allaying vomiting after other remedies have failed;

2 to 3 grains should be given, mixed with a little powdered sugar, every two or three hours. This is, however, usually found of most value in the next form of vomiting to be considered, viz. that dependent upon **utero-gestation.**

This is a form of vomiting often excessively troublesome to arrest, and in extreme cases it can only be relieved by dilatation of the cervix uteri, or by removing the uterine contents. In every case the urine should be carefully examined, lest a grave disease be mistaken for a mere troublesome disorder.

In the slighter cases, in which vomiting occurs only on rising from bed in the morning, a small light breakfast in bed, followed by an hour or so of repose, will often effect a cure. When vomiting is persistent, protracted rest in bed may be an absolute necessity; then food should be fluid—peptonised milk, albumin water, broths, Benger's food, and so on—and given in small quantities, whenever the patient feels able to take it. In such cases a small enema consisting of 20 minims of liquor opii sedativus, or 15 grains of chloral hydrate, and 30 grains of potassium bromide in 2 ounces of water, has been found very valuable; or 15 grains of sodium bromide in a tablespoonful of lime water may be given by the mouth twice a day. Chloretone in small doses of 3 grains, frequently repeated, is sometimes serviceable. The stronger alcoholic liqueurs are often useful in these cases, and small quantities of rum, cognac, Chartreuse or Kirsch may be given, dropped on a lump of sugar, from time to time. The risks of giving opium and alcohol to certain individuals must always be borne in mind. The late Professor Lasègue was a firm believer in the efficacy of tincture of iodine in such cases, given in 5- to 10-drop doses with syrup and water.

Creasote is sometimes very useful in arresting this, as well as other forms of vomiting; so also is menthol. Fifteen grains are dissolved in 5 drams of alcohol, and an ounce of syrup is added. A teaspoonful of this mixture is given every hour.

Hemmeter recommends the following mixture:—

℞ Cerii oxalatis ... ... gr. lx.
Cocainæ hydrochloridi ... ... gr. iij.
Menthol ... ... gr. xij.
Bismuthi salicylatis ... ... ʒj.
Elixir simplicis .. .. ad ℥vj.

Misce, fiat mistura. A tablespoonful on an empty stomach four times daily.

Engelmann has recorded a case in which the exhaustion and emaciation were extreme, and in which he prescribed 10 drops of a 10 per cent. solution of cocaine three times a day. After the first dose water was retained in the stomach, and the following day the patient was able to keep down a cup of coffee, and subsequently some soup. Two days afterwards the dose was diminished, and the treatment was soon discontinued without any return of the vomiting. In this case all the other remedies tried had failed.

Cocaine has also been given hypodermically in these cases with success—$\frac{1}{6}$ grain just before taking food twice or thrice daily.

Silver nitrate is sometimes of use—$\frac{1}{6}$ grain in a wineglassful of water, given continuously every six hours.

Ingluvin has been found by Papp to arrest this form of vomiting. He gave 4 grains half an hour before food, and 2 tablespoonfuls of a 1 per cent. dilution of hydrochloric acid immediately after food.

Frommel has obtained very good results from basic orexin.*

Lublesky, of Warsaw, and some other foreign physicians have strongly advised the use of the ether spray, applied to the epigastrium by means of a Richardson's pulveriser for three or four minutes at a time, before the patient attempts to take food. Injections of chloral, inhalations of oxygen, lavage of the stomach with weak alkaline solutions, counter-irritation with mustard over the stomach, and various

* Hemmeter, "Diseases of the Stomach," p. 634.

other expedients have been advocated for the relief of this troublesome symptom. Sometimes quite simple measures are sufficient to afford relief, e.g. a tablespoonful or two of lime water every two or three hours, alone or with an equal quantity of milk; or a simple effervescing mixture, with 3 to 5 minims of dilute hydrocyanic acid in each dose; or 2 or 3 minims of liquor opii sedativus with a few grains of sodium bicarbonate in two tablespoonfuls of hot water half an hour before attempting to take food.

Ringer advocates minim doses of ipecacuanha wine, with or without small doses of nux vomica, to be given every hour for this and other kinds of vomiting. This should certainly be tried, but we have not found it at all so efficacious as Ringer has.

The cases of **periodical vomiting,** described by Leyden, seem to us to have a close relationship with those cases which we term "sick headaches" in this country. Their periodical recurrence, without any warning, when the patient may be in good health, the circulatory depression, the intense headache, the acid vomiting, the loss of appetite, the tendency to recur for many years, compose a pathological picture very familiar to English physicians.

Gastralgia, or Gastrodynia

These designations are applied to certain painful conditions of the stomach referable to an affection of the gastric nerves—the pneumogastric or the sympathetic—and independent of organic disease or functional alteration of its muscular or glandular structures. Whether dependent on local irritation, immediate or remote, or general constitutional states, these conditions must be considered as neuralgic, and their treatment must be guided to some extent by the same principles as determine the treatment of other painful **neuroses.**

These painful affections of the stomach are often associated with anæmia, chlorosis, and debility, and would appear in such cases to be due mainly to an

impoverished state of the blood. In neurasthenic and hysterical cases, and especially in those connected with organic or functional disorder of the female sexual organs, attacks of gastralgia are exceedingly common, and they are apt then to take place exclusively, or with especial severity, at the menstrual periods. So also in diseases of the abdominal viscera, for instance in the various forms of visceroptosis, gastralgia may be excited by irritation conveyed along the branches of the sympathetic. In not a few cases severe and persistent gastralgia has been ultimately traced to a small commencing hernia in the abdominal wall, usually at the linea alba. This condition is characterised by pain on walking or on exertion, which almost invariably is at once relieved by recumbency. Gastralgia may occur in those morbid states of the blood determined by malaria, by rheumatism, gout, and by other dyscrasiæ.

Attacks of gastralgia may also be of central origin, and depend on disease of the gastric nerves at their source, as in the crises of locomotor ataxy.

It is obvious that the cause of such attacks must occasionally be obscure, and difficult of discovery. When attacks of gastralgia are induced by certain ingesta which would not cause pain under normal conditions, we must regard the attacks as due, to some extent, to a morbid hyperæsthetic state of the extremities of the gastric nerves.

Gastralgia, like other neuralgias, is apt to occur in any circumstances which lead to general malnutrition, and especially in those which produce exhaustion of the nervous system, so that masturbation and sexual excesses must be included amongst its causes. Excessive use of tobacco is also a cause of this affection.

The successful treatment of gastralgia will depend, in the first place, on one's ability to distinguish it from other morbid states giving rise to pains in the region of the stomach; we must, therefore, consider briefly the characteristic **symptoms** of gastralgia.

The pain in this affection is apt to come on suddenly, and in paroxysms, and then to pass away completely for a time. In some cases the pain is very violent. "Severe griping pains in the pit of the stomach, usually spreading into the back, faintness, shrunken countenance, cold hands and feet, and small intermittent pulse. The epigastrium is either puffed out like a ball, or, as is more frequently the case, retracted, with tension of the abdominal walls. There is often pulsation in the epigastrium. External pressure is well borne (unlike the pain of ulcer and cancer), and not infrequently the patient presses the pit of the stomach against some firm substance, or compresses it with his hands. . . . The attack lasts from a few minutes to half an hour; then the pain gradually subsides, leaving the patient much exhausted, or else it ceases suddenly with eructations of gas or watery fluid, with vomiting, with gentle perspiration, or with the passage of pale or reddish urine." * There is sometimes a craving for food, and the pain is relieved by taking food—a circumstance which also differentiates this disease from most other morbid states of the stomach. Complete loss of appetite is, however, not uncommon. More or less long intervals between the attacks also serve to distinguish it from the more or less continuous pain of cancer and other affections. When due to malarial causes the attacks may be periodic.

One of the most important considerations is to recognise and distinguish the less severe forms of gastralgia occurring in chlorotic girls from gastric ulcer, which is also so frequently found to exist in such patients. The pain of gastric ulcer is usually aggravated, and not relieved, by taking food; and a careful diet or complete abstinence will be attended with the best results. Abstinence will, however, often aggravate the gastralgia of chlorosis. The occurrence of left-sided pain is exceedingly common in chlorotic and hysterical girls, and it is sometimes

* Romberg.

referred to the gastric and sometimes to the cardiac regions, and sometimes more vaguely to the left side generally. It is often very difficult to determine the nature of this left-sided pain ; in some cases it is doubtless gastralgic, in others it is dependent on neuralgia of the lower intercostal nerves, as may be detected by pressure over the lower interspaces ; in others it would seem to be actually cardialgic, and dependent on a hypersensitive state of cutaneous areas in nervous connection with the enfeebled heart.

It is often difficult at first to distinguish between attacks of biliary colic and gastralgia, and when there is no jaundice or other sign of biliary obstruction, we must be guided chiefly by the history and antecedent and concomitant circumstances of the case.

We have also to bear in mind that gastralgia may coexist with diseases of the stomach, or other abdominal viscera : the possibility of the presence of a duodenal ulcer or of a diseased appendix must not be overlooked. But, having satisfied ourselves of the neurosal character of the disease, the question that has here to be discussed is how it can best be relieved or cured.

When we are able to trace the gastralgic attacks to some obvious cause, the **indications for treatment** are direct and clear. If they are found to occur after taking particular articles of food or drink, these must, of course, be eliminated from the dietary. Tea, coffee, tobacco, particular kinds of wine, even milk and eggs, certain kinds of raw fruit and vegetables, some varieties of fish or shell-fish, will induce in certain persons attacks of gastrodynia. In such persons very careful observation should be made of the effects of different articles of food, and a suitable dietary constructed, from which those that disagree with them are excluded.

It is important to bear in mind the well-recognised association of tobacco-smoking with some forms of gastralgia.

In **chlorotic** and **anæmic** cases our efforts should be directed to restore a normal condition of blood and nutrition. For this purpose ferruginous and other tonics must be given. Some preparations of iron agree much better with these patients than others. Leube * prefers the lactate of iron, or the ferrum redactum, in 3-grain doses, mixed with some aromatic powder, or with extract of cinchona. He also recommends in such cases 8 drops of dilute hydrochloric acid in a wineglassful of water two hours after food. We have found the following modification of Blaud's pills very useful :—

℞ Ferri sulphatis exsiccati ... ... gr. ij.
Potassii carbonatis ... ... gr. j.
Pulveris nucis vomicæ ... ... gr. j.
Mucilaginis ... ... quantum sufficiat
Ut fiat pilula. One three times a day, an hour after food.

Another combination we have found useful in these cases is the following :—

℞ Ferri et quininæ citratis ... ... gr. x.
Liquoris strychninæ ... ... ♏iij.
Acidi hydrochlorici diluti ... ... ♏v.
Aquæ chloroformi ... ... ad ℥j.
Misce, fiat haustus. To be taken an hour after food three times daily.

Dr. Huchard finds the following pills valuable in these cases :—

℞ Ferri tartarati ... ... ʒijss.
Extracti gentianæ ... ... ʒij.
Extracti nucis vomicæ ... ... } āā gr. iv.
Extracti opii ... ... }
Misce, et divide in pilulas numero centum. Two to be taken immediately before each meal.

Ewald prefers an albuminate of iron which he roughly prepares by adding the solution of perchloride of iron to a mixture of egg albumin and water, 1 to 5.

The saccharated carbonate of iron is a mild and easily-digested form of iron, and can be given in a

* Von Ziemssen's "Cyclopædia of the Practice of Medicine," vol. vii., p. 306.

powder of 5 to 10 grains after meals three times a day.

Strychnine has been found curative in some cases, especially those of neurasthenic origin. From $\frac{1}{80}$ to $\frac{1}{50}$ grain may be given hypodermically; or three minims of the liquor strychninæ in a tablespoonful of chloroform water may be given twice or three times a day, an hour before food.

In anæmic cases which fail to benefit by the pharmaceutical preparations of iron, it may be advantageous to prescribe a course of iron water at Spa, Schwalbach, Pyrmont, or St. Moritz.

When masturbation is the cause—and this is a common cause of neurasthenia in young lads—Leube advises cold frictions of the whole body and removal to the seaside for sea-baths, or to St. Moritz for its mountain air and iron springs.

Cases having a **malarial** origin must be treated with quinine or arsenic. Quinine must be given in adequate doses—5 to 10 grains dissolved in lemon juice three times a day; if quinine is not well borne or fails to relieve, arsenic should be given—3 or 4 minims of the liquor arsenicalis after meals three times a day. Or it is sometimes better to give a small dose of arsenic, 1 minim of Fowler's solution, in water, immediately before meals, for some considerable time; and this method is applicable to other than malarial cases.

The purely **hysterical** forms are often very difficult to relieve. The simple remedy of a few days in bed, ensuring complete physical and mental repose, is one that is too often neglected. Bromides, alone or in combination with valerian and other antispasmodic drugs, should be tried.

Soupault recommends the following:—

℞	Calcii bromidi	℥ijss.
	Chloral hydratis	gr. xl.
	Codeinæ	gr. iij.
	Aquæ laurocerasi	℥iij.
	Aquæ...	ad ℥vj.

Misce, fiat mistura. A tablespoonful every four hours.

The valerianate of zinc or of iron in grain doses in pills, three times a day, after food, is, perhaps, one of the best remedies in these cases; or 10 to 15 grains of bromide of sodium or ammonium in an ounce of infusion of valerian with 20 minims of spirit of chloroform, an hour before meals twice or three times a day, may be given; or 5 grains of the pil. asafœtidæ co. thrice daily. Sea-bathing, if it can be borne, is likely to be of more permanent use than drugs in these cases; or the judicious use of cold compresses or douches in a hydropathic establishment, together with massage, or the application of the constant current; the latter is sometimes very efficacious. The more severe and persistent attacks that are sometimes met with in young women are best treated by isolation and absolute rest, with careful supervision of diet, and as few drugs as possible.

Max Einhorn advocates as especially beneficial the intraventricular method of applying the galvanic current. He says, "It rarely fails to relieve the most intense and obstinate cases of idiopathic gastralgia" if applied for a period of from four to six weeks.* Hemmeter also refers to the galvanic current as a most effective remedy. He uses "large felt-covered copper plates dipped in water as hot as the patient can stand, the anode placed on the epigastrium and the cathode on the spinal column extending from the cervical region downward between the scapulæ." For this purpose he uses "very strong currents, not less than 25 milliampères."

If the attacks are dependent on some uterine affection, such as retroflexion, appropriate local treatment must be instituted.

Careful search should always be made for the slightest suspicion of a commencing hernia, especially in the linea alba, and if such is found we must adapt an efficient truss, or submit our patient to operation.

When the attacks are associated with the **gouty**

* "Diseases of Stomach" (2nd edit.), p. 413.

or **rheumatic** state, the constitutional condition on which they depend must be treated. The gouty attacks will require very careful dieting and eliminative treatment—the free exhibition of draughts of hot water, or, if there is much acidity, warm Vichy water; if there is constipation, warm Carlsbad water, in addition, taken in the morning fasting.

Hot compresses or mustard poultices to the epigastric region, and warm baths, will be useful in both gouty and rheumatic cases.

In the gouty cases attempts to provoke revulsion to the joints may be made by the use of hot foot-baths of mustard and water, or mustard poultices to the feet. It is also advisable to give some diffusible stimulant to relieve the sense of general depression and apprehension which usually accompanies gouty gastralgia, such as the following:—

℞ Ammonii carbonatis ... ... gr. v.
Spiritus ætheris compositi... ... ... ♏xx.
Aquæ menthæ piperitæ ... ... ℥jss.
Misce, fiat haustus. To be taken every three or four hours until relieved.

Many other remedies have been suggested, such as alum in 15-grain doses three times a day, between meals, potassium iodide, salicin, and sodium salicylate; the last three would certainly merit a trial in rheumatic cases.

Passing now from the fulfilment of the causal indications when these exist, we must consider next the treatment of the attack **when the cause is unknown,** or when the **immediate relief of suffering** becomes the paramount indication.

In most of these cases opium or morphine in one or other of its forms will be needed. We should endeavour, however, to use as small doses as possible, and to avoid their frequent repetition; for not only is there the fear of inducing a craving for opium or morphine, and the creation of an opium habit, but these drugs have the great disadvantage of arresting

the hepatic and intestinal secretions, and, therefore, of causing constipation, loss of appetite, and sluggish digestion, so that the general nutrition becomes greatly impaired by their frequent use. We must not, however, hesitate to use them for the relief of pain when this is severe and when other means fail. The liquor opii sedativus (Battley) is the best form for giving opium in these cases, and it is well to combine it with ammonia and some aromatic, as in the following:—

℞ Liquoris opii sedativi ... ... ♏v ad x.
Spiritus ammoniæ aromatici ... ... ℥ss.
Aquæ carui... ... ... ℥j.
Misce, fiat haustus. To be taken when the pain is severe.

Or we may give $\frac{1}{6}$ to $\frac{1}{3}$ grain of the hydrochloride of morphine hypodermically, with $\frac{1}{120}$ grain of atropine to relieve the paroxysm. When the pain is less severe, $\frac{1}{2}$-grain doses of phosphate of codeine every eight hours have been suggested, also suppositories of opium and belladonna.

Cannabis indica has been found most useful in many cases in relieving the paroxysms of pain; it may be given as follows:—

℞ Tincturæ cannabis indicæ ... ... ℥j.
Mucilaginis acaciæ... ... ... ℥j.
Aquæ chloroformi ... ... ad ℥vj.
Misce, fiat mistura. Two tablespoonfuls for a dose.

In acute gastralgia accompanied with uncontrollable vomiting Struver has given with advantage cocaine and antipyrin combined (*see* Formulæ, p. 165).

Amyl nitrite and nitroglycerine deserve a trial: the influence they exert on unstriped muscle extends to the muscle of the stomach.

Many French physicians believe that we may avoid the too frequent recourse to opiates in some of these cases by giving chloroform water—a tablespoonful of the aqua chloroformi of the B.P. with some aromatic water—every quarter of an hour. Or a few drops of chloroform on a lump of sugar, or a small fragment of ice, may be swallowed from time to time. It has the

advantage of acting as an antiseptic as well as an anæsthetic, and of checking putrid fermentation in the stomach if any complication of that kind exists. Perles of ether, 3–5 drops at a dose, also deserve trial. Cocaine hydrochloride may serve the same purpose as opium if the gastralgia depends on a hyperæsthesia of the peripheral ends of the gastric nerves. Half a grain dissolved in ½ ounce of chloroform water may be given for a dose; or in more chronic forms ¼ grain may be made into a pill, with a grain of extract of valerian, and given three times a day. Hoffman's anodyne is another time-honoured remedy.

In hysterical cases associated with vomiting and spasm, Ewald has found the following drops useful:—

℞ Morphinæ hydrochloridi ... ... gr. iij.
Cocainæ hydrochloridi ... ... gr. v. ad viij.
Tincturæ belladonnæ ... . ʒj. ad ʒij.
Emulsionis amygdalæ amaræ ad ℥j.
Ten to 15 drops every hour.

Bismuth subcarbonate is often found useful in chronic cases. Its action would seem to be entirely local, and it should therefore be given in large doses, such as 30 grains three times a day, together with 3 to 5 minims of dilute hydrocyanic acid and an ounce of mucilage and water. Occasionally purgatives must be given when these large doses of bismuth are used, to avoid the possibility of concretions of this drug forming in the bowels.

Hydrocyanic acid alone will often relieve the pain of gastralgia, but it is a somewhat uncertain remedy, and we probably fear to give it in adequate doses.

Nitrate of silver may also be tried in chronic obstinate cases, ¼ grain in a pill with or without ½ grain of extract of opium, an hour before taking food, twice or thrice daily.

Benefit is sometimes derived from the application of an opium or belladonna plaster to the epigastrium, or from frictions of this region with opium or belladonna liniment; or a combination of equal parts of

opium, belladonna, and chloroform liniments; or a hot-water bag.

Soupault recommends the application of a cold compress to the epigastrium at nights; and when the pain is excited by taking food, for half an hour before each meal.

ADDITIONAL FORMULÆ

For hæmatemesis

℞ Plumbi acetatis, ʒj.
Acidi aceti diluti, ʒjss.
Liquoris morphinæ acetatis, ʒijss.
Aquæ destillatæ ad ℥viij.
M. f. mist. A tablespoonful in a little water every two hours. (*Whitla.*)

Mixture for hæmatemesis

℞ Olei terebinthinæ, ʒiij.
Extracti digitalis fluidi, ʒj.
Mucilaginis acaciæ, ʒiv.
Aquæ menthæ piperitæ ad ʒij.
M. f. mist. A tablespoonful every three hours. (*Bartholow.*)

Cachets for acid gastralgia

℞ Bismuthi subnitratis, Magnesiæ ponderosæ, Cretæ preparatæ, Calcii phosphatis, āā ʒijss.
M. f. pulv. To be divided into 40 cachets, and one taken before every meal.
(*Dujardin-Beaumetz.*)

Hypodermic injection for sea-sickness

℞ Morphinæ hydrochloridi, gr. iv.
Atropinæ sulphatis, gr. ½.
Aquæ laurocerasi, ℥ss.
M. f. solutio. 15 minims is a dose. (*Dujardin-Beaumetz.*)

Resorcin pills for sea-sickness

℞ Resorcini puri, gr. jss ad ij.
Sacchari lactis, gr. ij.
M. f. pil. To be taken every two hours. (*H. Menche.*)

Pills for the vomiting of phthisis, of pregnancy, and of gastritis

℞ Cocainæ hydrochloridi, gr. ⅛.
Opii extracti, gr. ¼.
Glycyrrhizæ pulveris, q.s.
M. ut f. pil. To be taken five or six times a day, ten minutes before taking food.

Mixture for the vomiting of pregnancy, and in other forms of vomiting of both peripheral and central origin

℞ Cocainæ, gr. ij.
Antipyrin, gr. xvj.
Aquæ, ʒiij.
M. f. mist. A teaspoonful every half-hour or hour.
(*Struver.*)

Enema for vomiting of pregnancy

℞ Sodii bromidi, Chloral hydratis, āā ʒss.
Lactis et aquæ ad ℥ix.
M. f. enema. (*Guéniot.*)

For sea-sickness

℞ Menthol, gr. ijss.
Cocainæ hydrochloridi, gr. xj.
Alcohol, ʒiij.
Syrupi, ʒjss.
M. f. mist. A teaspoonful every half-hour. (*Lavallée.*)

Another

℞ Chloroformi
Tr. nucis vomicæ } āā ♏x.
Tr. lavand. co. ʒj.
Aquæ, ʒx.
M. f. mist. A teaspoonful every hour until relieved. (*Barber.*)

For gastralgia associated with mild putrefactive processes

℞ Chloral hydratis, gr. lxxx.
ad ʒij.
Aquæ ad ʒv.
M. f. mist. A tablespoonful every two hours. (*Ewald.*)

For gastralgia

℞ Cocainæ hydrochloridi, gr. ½.
Chloral hydratis, gr. x.
Aquæ menthæ piperitæ, ʒj.
M. f. haust. To be taken occasionally. (*Ewald.*)

Pills for gastralgia

℞ Argenti nitratis, gr. iv.
Pulv. opii, gr. iij.
Pulv. rhei
Extracti lupuli } āā gr. xij.
M. et divide in pil. xij. A pill twice or thrice daily half an hour before food.

For gastralgia

℞ Quininæ sulphatis, ʒss.
Extracti belladonnæ, gr. v.
Extracti valerianæ, q.s.
M. et divide in pil. xv. One thrice daily. (*Millet.*)

Antispasmodic for painful gastric spasm and flatulence

℞ Spiritus ammoniæ aromatici, ℥ss.
Spiritus ætheris compositi, ʒij.
Liquoris morphinæ hydrochloridi, ʒj.
Aquæ menthæ piperitæ, ad ℥viij.
M. f. mist. A tablespoonful for a dose.

Powders for gastralgia

℞ Codeinæ phosphatis, gr. ¼.
Bismuthi subnitratis, gr. v.
Sacchari lactis, gr. iij.
M. f. pulv. To be taken every two hours. (*Ewald.*)

CHAPTER VII

TREATMENT OF DISEASES OF THE STOMACH: DYSPEPSIA AND GASTROPTOSIS—MODERN GASTRIC METHODS

ATONIC DYSPEPSIA: Causes—Defective Relations between Diet and Digestive Capacity—Dyspepsia of Early Infancy—Overfeeding—Drinking at and before Meals—Hasty Feeding—Symptoms of Functional Dyspepsia distinguished from those of Gastric Catarrh—Pseudo-anginal Symptoms—State of Bowels and Urine—Incidental Nervous Symptoms—"Gastric Cramp," or Paroxysmal Pyrosis—*Treatment*—(1) *Dietetic*—Importance of careful Mastication—Selection and Preparation of Foods—Intervals between Meals—Beverages—(2) *Regiminal*—Exercise and Fresh Air—Change of Air and Travel—Hydrotherapy—Clothing—(3) *Medicinal*—Vegetable Bitters—Hydrochloric Acid and Pepsin—Strychnia—Iron—Alkalis—Soda—Olive Oil—Menthol—Creasote—Bismuth—Charcoal—Lozenges to promote Salivary Flow—Hot Water—Sodium Bicarbonate—Lavage—Mineral Waters—Dinner Pills—Calomel. Intestinal Dyspepsia—"Secondary Dyspepsia"—"Nervous Dyspepsia"—*Treatment*—Hydrotherapy—Massage—Electricity—Change of Air—Rest—Exercise—Congenial Surroundings—Medicines—Papain, Pancreatin, Lactopeptin, Taka-Diastase.

GASTROPTOSIS: Causes—Symptoms—*Treatment*—Abdominal Supports—Operative Measures.

Modern Gastric Methods. Additional Formulæ.

DYSPEPSIA

THE somewhat vague term dyspepsia, when used alone, as the designation of a morbid state, refers generally to a disturbed condition of the digestive functions, the existence of which is independent of any structural or inflammatory change in the stomach itself. There is undoubtedly some force in the remark of Dujardin-Beaumetz that the term dyspepsia ought to disappear from our list of diseases, as it is a symptom, or rather a more or less varied collection of symptoms, common to different diseases of the stomach.

So also in most serious organic and constitutional

affections, such as the specific fevers and acute and chronic visceral inflammations, some amount of dyspepsia, i.e. disturbed digestion, is an almost constant symptom, the functions of the digestive organs sharing in the general functional disturbance. In such cases the dyspepsia is either simply a part of a general malady, or a disorder excited by or dependent on disease of another organ, such as the appendix.

There are, however, some morbid states accompanied with disturbed digestion in which it is not always clear whether the dyspepsia stands in the relation of cause or effect to the other coexisting malady; as, for instance, in such diseases as gout and rheumatism, as well as in some vague affections of the nervous system.

It is difficult, therefore, to treat the subject of so-called *functional* dyspepsia with any great precision. To omit it altogether, as Leube does in von Ziemssen's Cyclopædia, or to class it under the gastric neuroses, as other writers do, appears to us equally unjustifiable. For there is certainly a practical need for its separate consideration, and although many cases which were at one time grouped under the vague heading of dyspepsia now find their place more appropriately under the more precise designations of acute and chronic gastric catarrh, dilatation of the stomach, and gastralgia, there yet remains a very large group of sufferers from disordered digestion who cannot be so classified. It is to their condition that the term dyspepsia must be applied, and it is to its treatment that our attention must now be directed.

The search for a **causal indication** for treatment in many of these cases is exceedingly difficult, and in their investigation the skill and practical sagacity and penetration of the physician are often most severely taxed.

It is assumed that in most cases of dyspepsia the gastric juice is altered in quality or quantity and that muscular action is disturbed, and sensitiveness increased.

But we have then to consider what are the causes of this disordered secretion of gastric juice and this disturbance of movement in the stomach walls.

No doubt depressing agencies of all kinds may directly or indirectly impoverish or vitiate the gastric secretions, and so induce a dyspeptic state. Exhausting illnesses; overwork, physical and mental; depressing emotions; anxiety and worry; insanitary surroundings and habits, or an unhealthy climate or residence; sedentary occupations; vicious indulgences, indolence, and want of exercise—all these may induce imperfect blood formation and the anæmic state, and a consequent defective secretion of the digestive agents. It has been suggested with great probability that in some cases, and especially with Americans, dyspepsia is hereditary. The eager and hasty struggle for wealth, and the inordinate activity and mental excitement dependent thereon, together, probably, with faulty habits of feeding, seem certainly to have made of the modern American a dyspeptic type, the signs of which are seen even in early childhood.

One very certain and common cause of dyspepsia is the neglect to discover and establish a *due relation between the diet or food taken and the natural digestive capacities or peculiarities of the individual.* These natural peculiarities, or idiosyncrasies, are of great importance, and should be carefully inquired into and observed. One person secretes habitually a large quantity of salivary ferment, another a comparatively small amount; or one individual secretes naturally a large quantity of gastric juice, another a comparatively small quantity; so with the bile, as we frequently see, and so, no doubt, with the pancreatic and intestinal ferments. Now, it may happen that the persons who secrete a large quantity of gastric juice * may secrete a comparatively small quantity of

* With regard to the source of the acid in acid dyspepsia, Sir William Roberts maintains that it is derived exclusively from excessive secretion or accumulation of gastric juice, and not from any fermentive process. "The sort of windy turmoil," he says, "which goes on in the stomach of the dyspeptic has led observers

saliva and of bile; or vice versa. If the individual who secretes a large quantity of gastric juice and a small quantity of salivary ferment and bile eats largely of farinaceous and fatty foods, he will become dyspeptic from inability to digest them; but if he eats largely of animal albuminates and sparingly of starches and fats, his digestion will be good and efficient. On the other hand, if another subject who secretes a minimum of gastric juice and a maximum of saliva and bile eats largely of animal flesh and but sparingly of carbohydrates and fats, he may become dyspeptic and badly nourished.

That these differences exist cannot be doubted when we note how greatly the amount and character of other secretions, such as that of the skin, differ in different persons. It is our duty, then, to study each individual dyspeptic closely in order to be able to establish an accurate relation (or to correct an inaccurate one) between his diet and his natural individual digestive peculiarities; and the establishment of this relation may be all that is needed to cure his dyspepsia. The food also must be adapted to age and condition. Of the weakened and less active digestive functions of advancing age, less must be required; and strength will be better maintained, in many cases, by diminishing rather than increasing the quantity of food. The too frequent taking of solid food and the insufficiency of the intervals between meals is a common cause of disturbed digestion in feeble persons. Indifference or inattention as to the quality and the preparation of food is also the cause of much dyspepsia. The frequent occurrence of disorders of digestion in early infancy is to a great extent due to ignorance of, or inattention to, the physiological conditions of the digestive secretions and the natural digestive capacity at that early age, and nothing less than a careful study of these conditions can enable

too hastily to the analogy of vinous fermentation. A more precise examination of the incidents of acid dyspepsia lends no support to this view."—("Digestion and Diet," p. 241.)

us to treat these dyspeptic troubles of infant life successfully.

The symptoms of dyspepsia in infancy are rather *intestinal* than *gastric*, owing to the briefness of the sojourn at this age of milk in the stomach, and its rapid passage into the intestine. The child is tormented with griping colicky pains after each feeding; the abdomen becomes distended and tender to pressure; exaggerated intestinal peristalsis, accompanied with gurglings and rumblings, is evident; the stools have lost their natural bright-yellow colour and uniform consistence of health; they are grumous, presenting white masses of coagulated, undigested casein, and are of a somewhat offensive odour.

The infant becomes cross and irritable, its sleep is disturbed, and it is clamorous to be constantly fed; and each feeding is followed by eructations or vomiting of coagulated milk. If this condition of things is not remedied, the child becomes feverish, emaciated, and symptoms of gastro-enteritis appear. The suitable treatment and appropriate remedy for this state is to be found almost solely in an appropriate hygienic diet. Many infants are unable to digest cow's milk in any dilution on account of the size of its curd, and we must substitute some appropriate modification such as whey or peptonised milk, to which both cream and sugar of milk can be added. The value, however, of antacids and gentle aperients as adjuvants in these cases is undoubted. Lime water with a little milk, or calcined magnesia, which has the advantage of being aperient as well as antacid, or, if there is diarrhœa, a few grains of subnitrate of bismuth, may be mixed with the magnesia, or a small dose of Gregory's powder, or 15 to 30 minims of castor oil made into an emulsion with a little syrup and mucilage, may be given. One or other of these remedies is often useful to remove acidity, to allay irritative diarrhœa, or to sweep away offending substances from the bowels.

But the simple fact of the introduction of too

much food into the stomach is responsible for much of the dyspepsia of modern life, and a too great eagerness to follow a so-called "supporting" method of treatment in dealing with anæmic conditions and states of nervous exhaustion has been to some extent the cause of this. It should be borne in mind that in these cases the digestive powers of the stomach share in the general enfeeblement, and that they need relative rest and a diminution of work in order to restore their tone and vigour.

The habit, also, of drinking largely *at meals*, while it must interfere with the chemical activity of the gastric juice, also tends to encourage too large a consumption of food. Man is, perhaps, the only animal who drinks and eats at the same time. The desire to continue eating is greatly lessened if no beverage be taken at meals, and hence some of the success attending the abstinence from fluids during meals in the treatment of obesity. A certain amount of water is, of course, necessary for the wants of the system, and most articles of food contain a very large proportion of water in their composition; and no physician would object to a good draught of water, preferably hot, half an hour or so before eating, when it dilutes or washes away the residue of the former meal, and refreshes and prepares the stomach for the next.

Haste in eating and imperfect mastication and insalivation are also fruitful sources of dyspepsia. The food is not sufficiently crushed and subdivided by the teeth, and it is not sufficiently incorporated with the frothy saliva which aërates it and makes it readily permeable by the gastric and intestinal secretions.

These mechanical changes in the mouth are, doubtless, of as great importance in digestion as the chemical action of the salivary ferment. Starch-digestion can be supplemented lower down by the action of the pancreatic and intestinal juices, but when the food has once passed out of the mouth there is no other agency in the whole alimentary canal for mechanically crushing it.

In the foregoing observations, we believe, will be found enumerated the chief causes of functional dyspepsia.

Before proceeding to the question of treatment, it will be desirable to enumerate briefly the **symptoms** which are usually found to accompany this form of disordered digestion. They are much the same as those which accompany chronic gastric catarrh, and it is, therefore, not always easy to separate these two affections. But functional dyspepsia occurs more commonly in temporary attacks, recurring more or less frequently, and is induced by slight causes, such as a trivial error in diet, some mental worry or over-exertion, physical or mental; or it may be noticed when the patient's health becomes depressed from any cause. It must be remembered, also, that the dyspeptic person is especially likely to become the subject of gastric catarrh, or of gastralgic attacks. Loss of appetite and an uncomfortable sense of weight and fullness after taking food, flatulent distension of the stomach, with acid eructations, "heartburn," dyspnœa, palpitation and flushing after food, all these symptoms are usually observed. An absence of furring or coating of the tongue, and of any bad odour in the breath, is often a means of distinguishing atonic dyspepsia from chronic gastric catarrh. Stimulating articles of food, such as spices, pickles, and the like, will often relieve the distress of the atonic dyspeptic, while they will increase that of the catarrhal one. Some dyspeptics complain of pain between the shoulders extending to the left arm, and resembling the pain of angina, and if this is associated with a weak and irregular action of the heart, it may be difficult to distinguish these attacks from true angina. The fact, however, of their occurring after food, and not coming on after physical exertion, together with the presence of other symptoms of dyspepsia, will generally help us to distinguish between the two causes. Sometimes an examination of the heart will show that it is really feeble and dilated, and in such cases

treatment must be directed to restore the tone of the heart as well as that of the stomach.

The absence of thirst, of tenderness in the epigastrium, and usually of nausea and vomiting, is also relied upon as distinguishing functional dyspepsia from gastric catarrh.

Constipation is a very common and troublesome symptom in these cases, and must never be overlooked in their treatment. The urine may be pale and abundant, but it is also often high-coloured, and deposits lithates on cooling, owing to imperfect intestinal assimilation. Its specific gravity may occasionally be so high as to excite the suspicion of diabetes, but this is usually due to an increase in the ordinary urinary solids. It is often much darkened by boiling and nitric acid, assuming various shades of the well-known mahogany hue. In the neurotic it will often deposit an excess of phosphates; at other times crystals of oxalate of lime may be detected in the deposit on microscopical examination.

Various occasional and incidental symptoms are associated with attacks of dyspepsia. Some of these are probably caused by the non-elimination and the absorption into the blood of toxic substances occasionally produced during stomach or intestinal digestion; or these substances may be produced normally during one part of the assimilative process and destroyed in a later part; and the failure of this later act in the assimilative process may be the cause of some of the symptoms observed.

Giddiness is one of the most alarming of these symptoms, and is probably caused by some sudden vaso-motor disturbance. More protracted nervous affections in the form of migraine headaches, ocular migraine, hemiopia, and other visual disturbances are not rare.

Languor, drowsiness, depression of spirits, or irritability of temper and sleeplessness are also frequent.

The occurrence of "gastric cramp or paroxysmal

pyrosis" as an occasional symptom in the course of acid dyspepsia has been mentioned by Sir William Roberts * as a "peculiar and characteristic symptom." It consists in a sudden attack of cramp of the stomach with sudden profuse salivation, lasting half a minute to a minute. He suggests that the term "pyrosis" should be confined to these paroxysms. There is but little sense of nausea during the attacks, and they rarely culminate in actual vomiting. The saliva gushes from the mouth in great abundance, and it is unusually alkaline. The paroxysm only occurs when there is surplus acid in the stomach, and the relief which follows the paroxysm is due to the large quantity of alkali conveyed to the stomach in the saliva swallowed. These paroxysms of pyrosis may occur once a day, or once in two or three days, sometimes only once a week, once a month, or once a year.

The **treatment** of functional dyspepsia may be considered under three headings—(1) dietetic, (2) regiminal, and (3) medicinal.

1. **Dietetic treatment.**—We have already called attention to the part played in the causation of dyspepsia by imperfect mastication and insalivation. This must be strictly inquired into and remedied. Defective teeth should be seen to, and when this defect cannot be rectified, food should be given which needs but little mastication; the crumb of stale bread, thin dry toast, and some kinds of biscuit readily disintegrate in the mouth, whereas new bread forms tough, coherent masses there.

Vegetables should be reduced to the form of purées; potatoes especially should be mashed fine, and new potatoes which are "waxy" should be prohibited. All fats should be finely divided and mixed with other foods, and not eaten in lumps. If, owing to defective teeth and tenderness of the gums, mastication is painful, lean of meat should be pounded or reduced to pulp. The American mincer may be used for this purpose.

* "Digestion and Diet," p. 247.

The shorter-fibre meats are the best for dyspeptics, as they are more easily disintegrated. The quality of the meat should be looked to—different qualities of mutton, beef, or fowl will differ greatly in their digestibility. White-fleshed game is more digestible than the dark kinds; the delicate sole, whiting, or flounder than the firmer and richer-fleshed mullet, salmon, etc. Foods saturated with butter or fats must be avoided; they are almost impenetrable to the gastric juice. Sweetened dishes are also to be avoided as prone to excite acid fermentation, as well as all unripe fruits, nuts, and the uncooked cellulose of vegetables, as difficult of digestion. It is hardly necessary to insist that the preparation and cooking of the food should be good and savoury. Sauces and melted butter should not be taken: with fish, plain butter, if required, and a little lemon juice may be used. The bread should be carefully selected, as some kinds of bread are apt of themselves to cause dyspepsia; and too large a quantity of imperfectly masticated bread is a common source of disordered digestion. A good bread should be porous, crumble easily, and not mass together in the mouth in mastication. Some kinds of wholemeal bread, although very nutritious and pleasant to eat, are difficult of digestion, and will certainly aggravate the dyspepsia of some persons. Table rusks are an agreeable substitute for bread when it disagrees in any way.

The **meals** of a dyspeptic should be small or very moderate in quantity, and our object should be *to select a diet which, while it affords the necessary amount of nourishment to the body, imposes the smallest amount of labour on the stomach.* These small meals should be eaten slowly, and a sufficient time allowed to elapse between them to ensure the complete digestion of one meal before the next is taken. Solid food takes from five to eight hours to digest,* accord-

* The estimates published in books on the physiology of digestion, of the periods of time required for the digestion of different articles of diet in the stomach, will be found, when tested by

ing to its nature and quantity, and in old age and in persons of feeble digestion it may take longer. *This is one of the facts of feeble digestion most difficult to get accepted, not only by the patient, but often also by the doctor.*

Persons with no occupation are very apt to take food too frequently, and to suffer in consequence from dyspepsia.

The dyspeptic should rest for a short time before a meal, and for a longer time after one. Abuse of alcohol and tobacco, of tea and coffee, should be interdicted. In some cases of atonic dyspepsia a small quantity of sound wine or spirit with water, taken just before or after a meal, seems to serve as a useful stimulus to gastric secretion; the same purpose will be better served in many by 4 or 5 tablespoonfuls of hot clear soup at the beginning of the repast.

The use of tea * and coffee requires discrimination. When the dyspepsia is associated with acid hypersecretion it is best to avoid both. In other cases it is advisable not to take them with or soon after food—they then often retard digestion; but taken three or four hours after a meal, and taken alone, and not too strong, they appear to promote, in some persons, the final stage of stomach digestion. A cup of hot water, slowly sipped, and taken instead of tea or coffee three or four hours after a meal, proves very useful to most dyspeptics.

Boiled milk, taken while hot, and, if desired, diluted with any alkaline water, as a rule gives great relief in conditions of hyperacidity: during an acute access of hypersecretion it should be the only food. The lighter forms of fish, poultry and game, and plain butcher's meat, roast or boiled, are most suitable in

practice, especially amongst the dyspeptic and persons of middle and advanced life, to be far too brief.

* It is important to the dyspeptic that he should drink China and not Indian tea. The latter contains an injurious proportion of tannin.

conditions of chronic acid hypersecretion, on account of their faculty of binding acid. Salted and smoked meats should be avoided.

In anæmic cases a moderately stimulating diet is best: agreeably flavoured animal foods and soups are more easily digested than farinaceous and saccharine ones, which have a tendency to undergo acid fermentation in those with feeble digestions.

Individual peculiarities, as we have already said, must be carefully studied. The complexity of the disturbance of physiological activity is the great hindrance to treatment of dyspepsia by rigid rules. Hyperacidity, hypoacidity, hyperæsthesia are convenient terms, but no one of them covers *all* the ground in any individual case: they are conditions that call for modification, but not for complete alterations, of the general dietetic treatment.

2. The **régime** or mode of life of the dyspeptic requires careful attention. Sedentary habits must be given up, and free exercise in the open air insisted upon. Removal from the town to the country or to the seaside, or a tour in Scotland or amongst the Swiss Alps, will be found sufficient to cure many troublesome cases of dyspepsia. When this is not convenient, a course of hydrotherapy in a well-organised hydropathic establishment, where at the same time the food habits are carefully attended to, will often be of great service. When town life is inevitable, as much fresh air as possible must be secured, and some benefit may be derived from the regular use of some system of indoor medical gymnastics. During an acute attack, however, complete rest in bed is often called for.

Chill is a frequent cause of dyspeptic attacks. Warm underclothing should be worn, and boots that will keep out damp: some find security in the wearing of a flannel or knitted woollen abdominal belt.

More confirmed cases, especially when complicated with hypochondriacal symptoms, may require a more

prolonged period of travel and frequent change from place to place.

3. **Medicinal treatment** also will be needed in most cases—(*a*) *to promote the functional activity of the muscular coat and secreting glands of the stomach.*

For this purpose the vegetable bitters, quassia, gentian, calumba, nux vomica, chirata, bitter orange-peel, hop, etc.—combined with an alkali if there is excess of acidity with sour eructations, or with a mineral acid if there is reason to suspect a deficiency in the acid of the gastric juice — are of undoubted value in promoting the activity of the digestive functions and exciting appetite. It is difficult to explain how these vegetable bitters act, but from recent observations it would appear that, given a short time before a meal, they promote the secretion of free hydrochloric acid, and in cases where there is a tendency to deficiency of this acid in the gastric juice they prove efficacious gastric tonics. Either of those mentioned may be used, but the combination of calumba or gentian with nux vomica has appeared to us a most useful one. In cases where there are acid eructations the addition of sodium bicarbonate is most useful. We are in the habit of prescribing the following draught as one of the best remedies for atonic dyspepsia when taken half an hour or an hour before meals :—

℞ Sodii bicarbonatis ... ... gr. xv.
Tincturæ nucis vomicæ ... ... ♏xv.
Tincturæ calumbæ ... ... ʒss.
Spiritus ammoniæ aromatici ... ... ʒss.
Infusi aurantii compositi ... ... ad ʒj.

Misce, fiat haustus. To be taken three times daily, half an hour or an hour before food.

If, on the other hand, we find there is great slowness and torpor of digestion, probably from *insufficient acidity* of the gastric juice, we may give the above mixture, leaving out the soda and ammonia, and adding 10 minims of dilute hydrochloric acid,

6 or 8 grains of pepsin, and 3 minims of tincture of capsicum, immediately or soon after meals, thrice daily. It is better sometimes to give the pepsin during or at the commencement of a meal, and the acid bitter mixture an hour or two afterwards.

When there is great muscular debility and nervous exhaustion associated with this form of dyspepsia, 5 minims of the liquor strychninæ may be given instead of the nux vomica with each dose of the acid mixture.

There is a form of painful dyspepsia, frequently met with in anæmic girls, which we find responds very readily as a rule to the combination of carbonate of bismuth with citrate of iron and ammonia, and we generally order an iron and aloes or myrrh and aloes pill for the associated constipation.

(*b*) *To relieve acid eructations, discomfort, and flatulent distension.**

One of the most annoying troubles of dyspeptic patients is attacks of flatulence with sour eructations and "heartburn." Some warm stomachic and alkaline mixture should be given the patient for occasional use when these attacks occur, which they often do, two or three hours after a meal: 15 to 30 grains of bicarbonate of soda in half a teacupful of hot water will often suffice. The following draught is also very efficacious:—

℞ Tincturæ rhei ... ... ℥j.
Sodii bicarbonatis ... ... gr. xv.
Magnesii carbonatis ... ... gr. x.
Spiritus ammoniæ aromatici ... ... ℥ss.
Aquæ carui ... ... ad ℥jss.
Misce, fiat haustus. To be taken occasionally.

* The remarkable fact that, in cases of acid dyspepsia, the ingestion of a meal will sometimes relieve the dyspepsia, is thus explained by Sir William Roberts: "The acid residuum is not entirely got rid of when the next meal arrives; in this case the sour mucus for a short space of time floats on the surface of the new meal, and the eructations are consequently acid; but presently it mingles with the meal, and the degree of acidity of the total gastric contents is thereby reduced by dilution, and the eructations cease to be sour." Such persons "are cured, much to their surprise, by taking a full meal, the fact being that the new meal

Soda-mint tablets are useful expedients for this purpose, and are largely used: two or three dissolved in a wineglass of hot water, taken at bedtime, often relieve the discomfort that disturbs sleep.

Olive oil sometimes seems to prevent acidity: a dessertspoonful may be given one hour before each meal.

When the flatulent distension of the stomach is a very troublesome symptom, a pill containing creasote, menthol, or carbolic acid given immediately after food is often very efficacious in arresting it.

Creasote may be given in capsules, each containing 1 minim, and menthol in grain doses also in the same manner. Creasote, however, will prove irritating to some patients if given pure in capsules, and it is better to give it made into a pill (and menthol also) with powdered soap.

℞ Menthol, gr. j (*vel* creasoti, ♏ss).
Pulveris saponis, quantum sufficiat *
Ut fiat pilula. To be taken after food thrice daily.

* A little spirit may be needed to make the menthol and soap into a pill. The following has been given as a good formula for making creasote into pills:—

Creasote ... ... 15 grains.
Powdered liquorice root (not decorticated) ... 30 grains.

Set aside for a few minutes, and then add 3 drops of distilled water. Rub them together, and divide the mass into the number of pills desired.

Bismuth will be found very useful in relieving pain and flatulence due to hyperacidity, and it seems to have a tonic effect resembling that of iron in some of these cases: 10 or 15 grains may be added to each dose of the above alkaline mixture, suspended in tragacanth. Or we may prescribe the following mixture:—

℞ Liquoris bismuthi et ammonii citratis ... ʒj.
Sodii bicarbonatis ... ... gr. x.
Spiritus chloroformi ... ... ♏xx.
Infusi calumbæ ... ... ad ℥j.
Misce, fiat haustus. To be taken an hour before food three times a day.

gives the surplus acid work to do and so ends the attack."—("Digestion and Diet," p. 238.)

Bismuth lozenges have the advantage that they are easily portable, and handy for use whenever required.

Charcoal is a popular remedy for gastric flatulence, but we have not found it so efficacious as the above bismuth mixtures. It is sometimes given in combination with bismuth—5 to 10 grains of powdered wood charcoal with 5 grains of bismuth. This powder may be taken in a cachet immediately before or soon after a meal, according to the period when the flatulence is most complained of. Sir William Roberts suggested the sucking of gum lozenges to promote the natural flow of saliva, and so diminish the acidity of the stomach's contents by neutralising it with alkaline saliva.

A very simple and efficacious remedy for some forms of acid dyspepsia—those forms especially which are so common, of an excessive formation of acid towards the end of stomach digestion—is the administration of a draught of hot water three or four hours after a meal. This dilutes the acid contents of the stomach, and the discomfort or even pain caused by the excessive acidity is at once relieved. If, however, the amount of acid is very great, it is advisable to add a few grains of magnesia or of sodium bicarbonate to the hot water.

Dr. Huchard advocates very large doses of the sodium bicarbonate for the relief of severe paroxysms of gastric pain arising from hypersecretion of hydrochloric acid. In a case in which extremely severe pains, with pyrosis, occurred at 11 a.m., 3 p.m., and at midnight, and lasted an hour or more each time, after trying various modes of treatment without any good result, he at length gave frequent large doses of sodium bicarbonate with complete success. He holds that in these cases there is a continuous secretion of hydrochloric acid, not limited to the periods of digestion, but occurring also during the intervals; that the contact of this acid with the surface of the empty stomach induces a loss of power in the

muscular walls, while the excess of acid during digestion arrests the conversion of starchy foods into sugar, and these ferment in the stomach, and this fermentation, together with the loss of tone in the muscular wall, starts a tendency to dilatation. At the same time there is also a great tendency to the occurrence of ulceration of the mucous membrane from quite slight causes.

An adequate alkaline treatment is, therefore, urgently indicated. The patient just referred to was given 6½ drams of sodium bicarbonate in twenty-four hours in repeated doses of 15 grains, together with an alkaline water at his meals, and milk mixed with lime water. The next day the patient was greatly relieved, and the improvement increased from day to day. Some prepared chalk was added to the sodium bicarbonate, as the latter is too soluble, and its neutralising action is, therefore, too soon exhausted. The insoluble lime salt acts more slowly, and is dissolved only in proportion to the acid secreted. For the accompanying constipation the patient had also two large spoonfuls of calcined magnesia daily. The patient was cured. Dr. Huchard refers with justice to the "ridiculous fear of an alkaline cachexia" which prevents many practitioners from giving adequate doses of sodium bicarbonate in cases like this.

Lavage of the stomach, in the absence of dilatation, is only called for in exceptional cases of acid dyspepsia. Motor insufficiency is seldom present in simple, uncomplicated dyspepsia.

(*c*) *To promote complete elimination of the bye-products of a sluggish and disordered digestion, and to remove noxious accumulations in the intestinal canal.*

The paramount importance of relieving the constipation that accompanies most cases of atonic dyspepsia is evident. It is, perhaps, in many cases the original evil. The retention of noxious bye-products of digestion in the intestinal canal and their

absorption into the blood is probably the cause of many of the general symptoms present in chronic dyspepsia, e.g. the headaches, the giddiness, the languor and drowsiness, the mental depression, and the hypochondriasis; while the tendency to abdominal venous stasis which must necessarily be associated with an inactive state of the intestinal walls naturally leads to an impairment of the secreting functions of the glands of the stomach and intestine.

It is in responding very thoroughly to this indication that courses of mineral waters prove so valuable to dyspeptic patients. No more brilliant results are obtained in medicine than from the application of such courses of waters as may be obtained at Carlsbad, Marienbad, Kissingen, Tarasp, or Brides-les-Bains in cases of dyspepsia with habitual constipation. Some practitioners tell their patients that such courses are "too lowering"; but they are, on the contrary, health-restoring, and, therefore, tonic in the best and truest sense. They frequently prove tonic and restorative after all the so-called tonics, such as iron, quinine, strychnine, arsenic, etc., have utterly failed; and they do so by washing the intestines clean, by removing toxic accumulations, by promoting the abdominal circulation, by stimulating the secretion of the liver and all the peptic glands, and, in short, by promoting due elimination; and these excellent effects are associated with the hygienic influences of a suitable, well-regulated diet, and a life largely spent in the open air.

For cases of chronic atonic dyspepsia, dependent on defective gastric secretion, and muscular want of tone, the waters of Kissingen, Homburg, or Brides-les-Bains are most suitable. The Rakoczy spring at Kissingen is especially renowned for its curative influence in cases of atonic dyspepsia. In cases of irritative dyspepsia of a gouty nature, or in plethoric persons, the warm alkaline-sulphatic springs of Carlsbad are especially valuable. When the

dyspepsia is associated with loss of nervous tone, and a more bracing influence is needed, the greater elevation of Marienbad or Tarasp is particularly suitable. In cases where there is much gastric irritability, and a tendency rather to diarrhœa than constipation, the waters of Vichy or Neuenahr are more applicable.

It is quite practicable, if patients will submit to a strict régime of diet and exercise, and reside in a healthy, open situation during the treatment, to follow a course of these waters in England. We have repeatedly prescribed and directed such courses with excellent results. The waters of Leamington and Harrogate are suitable to some of these cases.

But other means may be adopted, and, indeed, are required, to relieve the constipation, and these will answer better with some persons than mineral waters. One of the best of these is a pill of a grain or two of extract of aloes, ½ or ¾ of a grain of powdered ipecacuanha, and a grain of soap, taken just before the principal meal of the day. If the aperient effect of this pill is not sufficient, it can be supplemented by taking next morning, fasting, in a tumblerful of hot water, this powder :

℞ Sodii sulphatis ... ... ℥j.
Sodii bicarbonatis ... ... gr. xv.
Sodii chloridi ... ... gr. x.

Misce, fiat pulvis.

On the other hand, there are cases which are very sensitive to the action of aperients. They require aperients, but they must be mild ones. With such patients the following pill serves not only as a gentle aperient, but also as an excellent stomachic, and stimulates gastric secretion :—

℞ Ipecacuanhæ pulveris ... ... gr. ½ ad ¾.
Rhei extracti ... ... gr. ij vel iij.
Nucis vomicæ extracti ... ... gr. ½.

Misce, fiat pilula. To be taken half an hour before food, twice or three times a day.

Tablets of cascara sagrada, 2–3 grains, suit some patients well.

In other cases no remedy seems so useful as small doses of calomel, its remedial action being greatly due to its efficacy as an intestinal antiseptic, and its powerful destructive influence on anaërobic bacilli.

Dr. Carter, of Liverpool, has testified strongly to the value of calomel in controlling the abnormal gastric and intestinal fermentations in children. He prescribes $\frac{1}{20}$ grain of calomel with 1 grain of boric acid with the child's food three times a day.

Under the designation **intestinal dyspepsia,** a variety of conditions have been described, dependent, some on functional or organic disease of the liver and pancreas, some on acute or chronic intestinal catarrh, and some forming really a part of the phenomena of gastric indigestion. These last only concern us now.

The normal course of intestinal digestion will necessarily be disturbed when the results of stomach digestion are abnormal, and the food is passed on from the stomach to the small intestine in an imperfectly prepared state. This may arise simply from over-feeding or from admitting into the stomach food that cannot be digested there. The dyspepsia of infants is often of this character. So, also, in cases of acid dyspepsia, the chyme passing into the small intestine may be so excessively acid as to destroy or greatly weaken the digestive powers of the alkaline bile and pancreatic juice, and thus symptoms of intestinal indigestion would be aroused. Duodenal catarrh and catarrhal jaundice may also be occasioned in this way.

But the treatment appropriate to these states is obviously that adapted to the amelioration of the disturbed gastric functions upon which they are dependent.

The treatment of so-called **secondary dyspepsia,** associated with cardiac and hepatic disease, with chlorosis, scrofula, tuberculosis, gout, rheumatism, and organic nervous affections, will be dealt with

when we come to consider the treatment of these morbid states.

We may, however, discuss briefly here the treatment best suited to those not uncommon forms of dyspepsia which are associated with what is termed "**nervous debility,**" and which are often induced by worry and anxiety, or by nervous exhaustion. The condition is occasionally induced by sexual excess. Many of the symptoms complained of must be dealt with on the general principles already laid down in the preceding pages, but we must not overlook the necessity of applying at the same time restorative treatment to the exhausted or irritable nervous system. Indeed, it is this that calls for treatment, even more than the stomach. Such cases are often marvellously benefited by a course of hydrotherapy associated with massage,* or with the application of the high-frequency current; or by change of climate, especially to mountain air (the seaside often

* Massage is very useful in some cases of atonic dyspepsia. It should be applied in the following manner: The patient, two or three hours after a full meal, should be placed on his back with the head and shoulders raised, the thighs flexed on the pelvis, the mouth a little open, and free respiration encouraged. The physician should begin by tapping or stroking gently and superficially over the region of the stomach; during these manipulations he should gradually increase the amount of pressure employed, till, after a longer or shorter time, according to the sensitiveness of the patient, he is able thoroughly to knead the stomach. All these manipulations, which should not last longer than about ten minutes, should be made in the same direction, i.e. from the cardiac end and the greater curvature towards the pylorus. The effect of this massage is to accelerate the passage of the food into the duodenum and to prevent its too prolonged stay in the stomach, and also to evacuate the stomach of any lingering imperfectly digested substances remaining from a previous meal. It further rouses the contractility of the muscular coat of the stomach, and increases the secretion of gastric juice. Massage of the stomach should be followed by massage of the intestines for about four or five minutes, to overcome coexisting constipation; the manipulation should of course follow the large intestine from cæcum to sigmoid flexure. The results observed to follow this treatment are a sense of relief and comfort immediately after the *séance*, and the disappearance of the distressing feeling of weight and heaviness so common, during the digestive process, with these patients. A desire to sleep is often experienced, and the hypochondriasis from which dyspeptics so often suffer is greatly relieved.

disagrees with such patients). To be in the open air as much as possible is imperative, and the amount of exercise or rest will be regulated according to the cause of the trouble and the condition of the patient. Congenial surroundings will do much to turn the patient's mind away from his own discomforts. Dietetic rules are notoriously unsatisfactory in dealing with nervous dyspepsia, and the only hope of success lies in studying the idiosyncrasies of each patient, and as far as may be adapting the diet to them.

Some medicinal remedies are also of use. In cases chiefly of nervous exhaustion, a pill of 1½ or 2 grains of valerianate of quinine with half a grain of extract of nux vomica, an hour before meals three times a day, will be found valuable; and in cases of irritability of the nervous system it will sometimes be found better to give 10 or 15 grains of bromide of sodium, with ½ dram of tincture of serpentary in an ounce of caraway water, half an hour before lunch and dinner. Boas speaks well of validol (a combination of valerian and menthol), 8 to 10 drops in sweetened water, three times a day.

As the gastric juice secreted by these patients is often defective in quality or deficient in quantity, or both, it is often advisable to supplement this by the administration immediately after food of a digestive ferment such as a dram of Benger's liquor pepticus or 6 or 8 grains of good pepsin, with 5 to 10 minims of dilute hydrochloric acid, 3 minims of liquor strychninæ, and 3 minims of tincture of capsicum, in an ounce of compound infusion of bitter orange-peel.

Papain has been advocated as a more reliable and more certain digestive ferment than pepsin; we have not, however, been able to satisfy ourselves that this is so. It is the active principle of the *Carica papaya*, or South American melon-tree. The papain extracted by Professor Finckler's process is considered to be the best. It is said to have the advantage over other digestive ferments of acting either in an acid, alkaline, or neutral medium. It

is also stated to be antiseptic in its action, and to exert a local tonic and sedative effect on the stomach.

The dose of papain Finckler is 2 to 5 grains dissolved in half a wineglass of water after meals. Pancreatin, lactopeptin, taka-diastase, and other artificial digestives have all been recommended, but those who have had most experience of them are the least likely to extol their virtues.

Gastroptosis in Glénard's Disease

Glénard's disease is a condition found almost exclusively in women, in which one or more of the abdominal viscera are displaced downwards, with stretching of their peritoneal attachments. Though in some cases the displacement may be apparent only in a single viscus, such as the stomach, kidney, or transverse colon, it is probable that all are simultaneously affected in a less degree.

Great differences of opinion exist as to the cause of this condition. Some consider that there is in all cases an underlying congenital defect; some refer it to yielding of the diaphragm, others to undue laxity of the supporting muscles of the abdominal wall. Faulty conditions of respiration, trauma, ill-health, neurasthenia, rapid loss of flesh, tight-lacing, insufficient exercise, and repeated pregnancies have all been invoked as predisposing causes in individual cases. Constant abdominal discomfort and pains of a dragging character are the most invariable symptoms. With these are commonly coupled, particularly in young subjects, some of the many manifestations of neurasthenia. When the abdominal walls are thin and flaccid, the descent of the stomach or transverse colon may be apparent at once in a marked sagging of all the abdominal contents; inflation of the stomach will enable us to define the degree of descent of its upper and lower limits. Examination by the X-rays after a bismuth meal will show the same condition, and in the case of the transverse colon we may find it

actually within the pelvis, and converted into a U-shaped tube. In the case of the kidney and spleen the condition is evidenced by the palpation of an unduly movable organ. Displacement of the liver is a much less frequent occurrence, and true hepatoptosis is seldom found except when repeated pregnancies have removed the whole supporting power of the abdominal walls. Constipation is nearly always present when the stomach or colon is displaced, and subacidity of the gastric secretion is said to be characteristic of gastroptosis.

The chief indications in treatment of these various conditions are:

1. To do what we can to strengthen the natural supports of the viscera.
2. To relieve associated conditions, such as pain, dyspepsia, constipation, neurasthenia.
3. If necessary to limit displacement or check mobility by artificial supports, or by surgical operation.

1. Tight corsets must be absolutely forbidden, and any clothing that hampers the free mobility of the thorax. In the case of pregnancy, support may be afforded by an abdominal binder both before and after parturition, and a full lying-in period must be rigidly insisted upon. Breathing exercises and Swedish movements have been employed with advantage to restore tone to the respiratory and abdominal muscles. General and abdominal massage may be of service, and some recommend electrical applications to the muscles of the lower thorax and abdomen.

2. Rest in bed at the outset is the quickest and surest means of relieving the dragging pain, of which so many of these patients complain: this should be maintained for four to six weeks at least, and return to normal habits of life should be most cautiously undertaken. On first getting up, it will be necessary to wear some form of abdominal support, to which we shall allude subsequently.

Anæmia may call for the use of iron and arsenic, and strychnine will be required in conditions of general debility. Constipation, dyspepsia, and neurasthenia should be treated on the lines laid down in the sections devoted to these various subjects. If digestive power is good a full diet is usually desirable, as this type of patient is apt to be spare and ill nourished.

3. The nature of the artificial support will necessarily vary with the organ principally at fault. In the case of the stomach and transverse colon, many forms of abdominal belts are now supplied by the various instrument makers. Our own preference is for one of silk-elastic webbing, made to the measurement of the patient, and laced over the spine. It should be laced from below upwards, so as to ensure appropriate pressure in an upward and backward position. These conditions cannot be as satisfactorily secured by those belts that are arranged to fasten with straps in front of the abdomen. Some perineal fastening will be needed to prevent "riding up" of the belt. Various forms of corset are supplied by expert corset makers, which can be used, if preferred, in place of the elastic belt. How long such a support must be worn, and whether it may ever be dispensed with, are questions that can only be answered by the experience of each individual case.

Operative treatment in cases of gastroptosis should only be recommended if other measures have failed to secure adequate relief. Various methods of raising the stomach and fixing it in position—gastropexy—have been devised. Some have passed sutures through the gastro-hepatic omentum, so as to shorten it; others have passed sutures through the lesser curvature, lesser omentum, and free edge of the liver; and the great omentum has been actually converted into a hammock for the repose of the vagrant stomach! Full details of the various operative procedures will be found in the textbooks of practical surgery.

Modern Gastric Methods

In the preceding chapters we have dealt with the treatment of the chief clinical types of gastric disorders. It would occupy much space, and would be of doubtful practical utility from the point of view of clinical therapeutics, to consider the various subdivisions and forms of dyspepsia, as they are set forth in some recent treatises on gastric diseases—such as "achylia gastrica," "neurasthenia gastrica," "hyperchlorhydria," "gastro-succorrhœa," etc. We must here, as elsewhere, be on our guard against the growth of mere phraseology, with which, to our thinking, medical science is already gravely overladen. It will be found that the treatment of most of the symptoms corresponding to these names have, in fact, been considered in the foregoing pages.

We must, however, in this place call attention, briefly, to certain methods of investigation and treatment of gastric maladies which take a more or less prominent position, nowadays, in special treatises on these affections. These methods have their limited uses, but they have also, unhappily, their almost unlimited abuses. The introduction and advocacy of elaborate technical and mechanical contrivances in the treatment of diseases which hitherto have been cured without them is not altogether a matter for congratulation.

Certain measures have been invented with the object of testing the efficiency of the functions of the stomach: (1) the functions of secretion; (2) the functions of absorption; (3) the motor functions.

1. In order to examine whether the gastric secretion is normal or not, it is usual to give the patient a **test meal**, and then to withdraw some of the contents of the stomach, for detailed examination, a certain time after the meal. Several test meals have been proposed by different physicians, but the simplest and best and the one most generally adopted is the test breakfast of Ewald and Boas. It is given in the

morning, fasting, and consists of one or two rolls of bread (about 2 ounces) and a cup of tea or water (8 to 10 ounces).

The stomach contents are examined about an hour after the meal. They may be obtained by the method of either **aspiration** or **expression.** In either case a soft rubber tube is introduced into the stomach in the usual way, and for aspiration a rubber bulb is attached to the outer end of the tube, and this bulb is first compressed and then released in the ordinary manner, and the gastric contents are thus made to flow into the bulb.* The expression method, which is considered the best and easiest way of obtaining the gastric contents, consists in causing the patient to exercise pressure upon the stomach by means of his abdominal muscles. He first inspires deeply, and then compresses his abdominal walls by coughing. The pressure thus exerted on the gastric contents expels them through the tube into a suitable receptacle held in the patient's hand. Usually it will suffice if the tube itself is filled with the gastric contents: the open end will then be closed by the finger as the tube is withdrawn.

Max Einhorn admits that this examination is often unpleasant and repugnant to the patient, and that some "absolutely refuse to submit to it."

To overcome this difficulty he has devised a "stomach-bucket"—a small silver capsule ($1\frac{3}{4}$ cm. long, $\frac{3}{4}$ cm. wide), with a large opening at the top and an arch to which a silk thread is tied, and a knot made in it 16 inches from the attachment. The patient is made to swallow this bucket with certain precautions —it is allowed to remain about five minutes in the stomach, and is then withdrawn and its contents examined. Some small details have to be attended to in this process, which Einhorn describes.† He says: "This method seems to be especially adapted to all cases where there is suspicion of an ulcer in the stomach,

* *See* Max Einhorn's "Diseases of the Stomach" (2nd edit.), p. 42.

† *Ibid.*, p. 64.

and when we desire to avoid the tube. It is also suitable for the general practitioner who does not intend to make an exact analysis of the gastric contents, but who desires to determine whether there exists in them free hydrochloric acid or not."

The contents are tested first with litmus paper—if this is reddened the contents are acid; second, with Congo paper—if this is turned blue it shows the presence of free acids; third, it is tested for the presence of free hydrochloric acid. For this purpose one drop of the contents is mixed thoroughly with one drop of *Günzburg's* solution* in a white porcelain dish, then heated over a spirit lamp, when the fluid evaporates. If a cherry-red colour appears, free hydrochloric acid is present.

If the contents of the stomach continue to give this reaction when diluted eight to ten times, the amount of acidity, it is stated, is probably normal; if when diluted to over twelve times they still yield this reaction they are probably too acid (hyperacidity); and if they fail to do so when diluted five times or less they contain too little acid (subacidity).

But we must not place too much reliance on these inferences.

The chief value of this examination to the general practitioner is the proof it gives of the presence of free hydrochloric acid in the stomach contents. A more detailed examination of the chemistry of the gastric secretion, as to the actual amount of hydrochloric acid, the amount and activity of the ferments, and the presence or absence of organic acids, must be left to the pathological chemist, as it will require far more time and more analytical skill than the general practitioner can possibly have at his disposal. And we have no hesitation in repeating that the value and import of such examination have been greatly exaggerated by some specialists.

* This "vanillin-phloroglucin test" can be made by dissolving phloroglucin 30 grains, vanillin 15 grains, in 1 ounce of alcohol.

Ewald's test meal is not altogether a satisfactory means of testing the presence of lactic acid, as the meal itself produces some lactic acid. Boas recommends a gruel, made by adding half a tablespoonful of oatmeal flour to half a litre of water. He gives this overnight, after washing out the stomach, and removes the residue in the early morning.

2. To test the absorptive functions of the stomach it is usual to give 2 or 3 grains of potassium iodide (preferably when the stomach is nearly empty) enclosed in a gelatin capsule, and to examine for its presence in the saliva every minute or two, by moistening a piece of starched paper with the patient's saliva and then adding a drop of nitric acid, when if iodine is present the characteristic violet or blue colour appears on the starch paper. In normal conditions this reaction appears in from six to eleven minutes. The method is not one on which much reliance can be placed.

3. To test the motor function of the stomach the "best and easiest way," according to Einhorn, "is to examine this organ, by means of the tube and lavage, in the morning, in the fasting condition, after the ingestion of a substantial supper on the night previous. Normally the stomach is empty, and therefore when the organ is found to contain a quantity of food, this is the best sign of retarded motion." Such a residue is usually strongly acid, and on testing exhibits the presence of albumoses.

Riegel's test meal is best adapted for this purpose. It consists of a plate of soup, a roll, a small beefsteak (about 60 grammes), and a glass of water. This is usually given overnight, and the amount and character of the residue removed in the morning will give a general indication of the degree of motor insufficiency. If preferred it may be given at 1–2 p.m., and examined after five to seven hours.

Ewald has recommended another method, which, as Einhorn rightly states, is by no means absolutely reliable. This is the salol test, and is based on the

property possessed by this drug of breaking up in the presence of a weak alkaline fluid into phenol and salicylic acid, while it is not decomposed in acid solutions. The salol, therefore, will not undergo any change in the acid contents of the stomach, but on leaving that organ and meeting the alkaline juices in the small intestine it splits up into phenol and salicylic acid, and the latter, entering the blood, is eliminated in the urine as salicyluric acid, and can be detected therein by its producing a violet colour when neutral ferric chloride solution is added.

To apply this test the patient is given two gelatin capsules filled with salol (about 7 grains in each) half an hour after a slight meal (having emptied his bladder immediately before): he then urinates every half-hour for two or three hours. All the specimens are then tested with ferric chloride, and we note in which the violet colour first appears. Normally it should appear in from forty to sixty minutes, but if the motor function of the stomach is feeble it may not appear for two hours, or even longer. A delicate way of applying this test is to moisten a piece of filter paper with the urine and then by means of a glass rod to place a drop of ferric chloride solution on the middle of the moistened paper. The edges of this drop will assume a violet colour if the smallest trace of salicyluric acid be present.

Huber has modified the salol test, so as to depend on the duration of the salicylic reaction in the urine. Normally it should disappear after twenty-six to twenty-seven hours: the excess gives the degree of motor insufficiency.

Examination of the patient in the erect position by means of the **X-rays** and screen after the ingestion of a *bismuth meal* gives much valuable evidence as to the muscular tone of the stomach; if we need also to ascertain the readiness with which it propels its contents into the small intestine, a series of photographs must be taken at definite intervals to ascertain the time that is required to evacuate the stomach completely.

Gastroscopy is still in its infancy, and in this country at any rate is unlikely to find general acceptance. It aims at illuminating the stomach after the manner of the cystoscope, and a view of the inner wall of the stomach is afforded to the observer by means of a system of prisms.

We have already described fully the method of lavage of the stomach; we must now refer to a method of **spraying the stomach** suggested by Einhorn. Its object, according to its author, is to enable us to apply medicines of a toxic or irritating character, without risk of producing poisonous effects, by using them in the form of a spray, "by means of which large surfaces can be covered with a comparatively small amount of fluid." We can thus either (*a*) disinfect the mucous membrane of the stomach, or (*b*) exert an astringent effect, or (*c*) produce analgesia in gastralgia dependent on ulcer, cicatrix, or cancer. The apparatus consists of an ordinary spray apparatus in which there is a soft Nélaton tube 70 cm. in length inserted between the nozzle and the hard rubber branch proceeding from the bottle; within the Nélaton tubing another soft tube of thinner calibre connects the inner capillary tube with the nozzle.

It is, of course, only possible to spray the stomach in its empty state; the method can only be applied when fasting, or after lavage. Einhorn maintains that spraying the stomach has proved very useful in erosions of the mucous membrane, in cases of chronic gastric catarrh with abundant secretion of mucus, and in cases of hypersecretion and hyperacidity. The method has not commended itself to most physicians.

We have incidentally alluded in preceding pages to the use of **electricity**, applied externally, in the treatment of gastric disorders; we must now refer again in rather more detail to the application of electricity in these affections both externally (percutaneously) and internally ("direct electrisation").

The method usually adopted for the external

application of electricity is to apply one electrode to the neighbourhood of the spine at about the sixth dorsal vertebra on the left side, and the second electrode to the epigastrium. This mode of applying electricity, combined with general electrisation, has been found of much value in treating nervous dyspepsias. It has also been found to produce a more abundant secretion of gastric juice, and to ameliorate the motor function of the stomach. It is stated that the faradic current influences chiefly the motor, and the galvanic the secretory function of the stomach.

Kussmaul was one of the first to practise direct electrisation of the stomach by introducing one of the electrodes into the stomach itself through a stomach tube; he treated several patients with dilated stomachs in this way. Bardet devised another method which was an improvement on Kussmaul's; but both methods were found, in practice, to be very exhausting to the patient.

Einhorn * has suggested another method which he considers avoids much of the inconvenience attending the preceding. He uses what he terms a "deglutable stomach electrode," which is constructed on the same principle as his stomach bucket. This, containing the electrode, is swallowed, and, instead of the silk thread, a very fine rubber tube is attached to the bucket, through which a very fine, soft, conducting wire runs to the battery.

"The end piece of the electrode consists of a hard rubber capsule with many openings. In this capsule lies a metallic button, which is connected with the wire. The rubber capsule serves to avoid the direct contact of the metal with the stomach wall; the circuit is completed by the water the stomach contains."

For a detailed account of the method of applying, by this means, directly to the stomach gastro-faradisation and gastro-galvanisation, we must refer to Max Einhorn's work. He states that he has found the method valuable in non-malignant chronic diseases of

* "Diseases of the Stomach" (2nd edit.), p. 143, Fig. 37.

the stomach, especially severe and obstinate gastralgia, cases of atonic non-obstructive dilatation of stomach, also cases of relaxation of the cardia (eructations) and relaxation of the pylorus (presence of bile in stomach).

Another instrument has more recently been devised for "internal massage" of the stomach by Dr. Fenton B. Turck, of Chicago. It is termed the gyromele, or revolving sound, and consists of a flexible cable, to the end of which is fixed a sponge covering a spiral spring. The cable passes through a rubber tube, which is attached to a revolving apparatus, for the purpose of producing revolutions of the sponge. Those who are not sceptical as to the fitness and value of these mechanical methods of treating the long-suffering stomach will find this instrument figured and described in Gillespie's "Manual of Modern Gastric Methods," pp. 132–34.

ADDITIONAL FORMULÆ

To promote appetite (in atonic dyspepsia)

℞ Tincturæ cascarillæ, ʒijss.
Tincturæ rhei, ʒv.
Tincturæ nucis vomicæ, ʒijss.
Tincturæ gentianæ, ʒx.
Tincturæ aurantii ad ℥iv.

M. f. tinctura. Two teaspoonfuls, in water, a short time before a meal. (*Huchard.*)

For chronic dyspepsia with deficient gastric secretion

℞ Acidi nitro-hydrochlorici diluti, ʒvj.
Liquoris strychninæ, ʒjss.
Tincturæ aurantii } āā ℥j.
Tincturæ calumbæ }
Infusi gentianæ ad ℥x.

M. f. mist. A tablespoonful in a wineglassful of water three times a day after food.

To promote appetite in dyspepsia

℞ Ammonii carbonatis, ʒj.
Potassii bicarbonatis, ʒjss.
Infusi chiratæ ad ℥vj.

M. f. mist. A tablespoonful three times a day. (*Charteris.*)

In atonic dyspepsia

℞ Extracti nucis vomicæ, gr. iv.
Extracti quassiæ, gr. xx.
Quininæ sulphatis, gr. xl.

M. et divide in pil. xx. One three times a day after meals. (*Hare.*)

Or

℞ Extracti chiratæ, gr. xl.
Extracti gentianæ, gr. xl.
Oleo-resinæ capsici, ♏ v.

M. et divide in pil. xx. One after each meal. (*Hare.*)

Powder for atonic dyspepsia

℞ Sodii bicarbonatis exsiccati, gr. v.
Magnesii carbonatis, gr. x.
Pulveris rhei, gr. vj.
M. f. pulv. To be taken before meals three times a day.

Chloroform mixture for flatulent dyspepsia

℞ Tincturæ anisi,* ʒij.
Aquæ floris aurantii, ℥iv.
Aquæ chloroformi (saturatæ) ad ℥viij.
M. f. mist. A dessertspoonful to be taken before or during a meal.

* French Codex.

For acid dyspepsia with pyrosis

℞ Magnesiæ, gr. ij.
Bismuthi subnitratis, gr. v.
Pulveris opii, gr. ss.
M. f. pulv. To be taken before eating. (*Piorry.*)

Resorcin mixture for acute gastritis and dyspepsia

℞ Resorcini (*pure white, bisublimated*), ʒss.
Acidi hydrochlorici puri, ʒss.
Syrupi aurantii, ʒv.
Aquæ destillatæ ad ℥vj.
M. f. mist. One tablespoonful every two hours.
(*H. Menche*)

For flatulent dyspepsia

℞ Tincturæ cardamomi compositæ, ʒiv.
Tincturæ zingiberis, ʒiij.
Spiritus ammoniæ aromatici, ʒij.
Spiritus chloroformi, ʒij.
Acidi hydrocyanici diluti, ♏xl.
Aquæ carui ad ℥vj.
M. f. mist. A tablespoonful occasionally. (*Charteris.*)

For dyspepsia in infants born before term

℞ Pepsinæ glycerini, ʒijss.
Acidi hydrochlorici diluti, ♏x.
Aquæ ad ℥iij.
M. f. mist. A teaspoonful ten minutes after each meal.
(*Prof. Monti, Vienna.*)

Alkaline powders for acid dyspepsia

℞ Bismuthi subnitratis, Magnesiæ ponderosæ, Sodii bicarbonatis ää ʒijss.
M. et divide in pulv. xxx. One to be taken before meals.
(*Dujardin-Beaumetz.*)

As a digestive in flatulent dyspepsia

℞ Pancreatin, Sodii bicarbonatis, Magnesiæ ponderosæ ää ʒj.
Nucis vomicæ pulveris, gr. vj.
M. et divide in pulv. (or cachets) xx. One at the beginning of each meal.
(*H. Huchard.*)

Drops for flatulent dyspepsia

℞ Chloroformi, ♏xl. ad lxxx.
Tincturæ anisi, ʒij.
Tincturæ nucis vomicæ, ʒij.
Tincturæ gentianæ, ʒij.
M. Take 10 to 20 drops in a little water, at least a quarter of an hour before a meal. (*H. Huchard.*)

Fleiner's treatment of hyperchlorhydria

2½ to 5 drachms of bismuth subnitrate suspended in water, and given through the œsophageal tube, when the stomach is empty, before breakfast. for twenty to twenty-five days.

For flatulent dyspepsia with dilated stomach

℞ Hydrargyri perchloridi, gr. $\frac{1}{24}$.
Strychninæ sulphatis, gr. $\frac{1}{24}$.
Creasoti, ♏j ad ij.

M. f. pil. To be taken before, between, or after meals. (*Broadbent.*)

For offensive eructations (H_2S) in cases of gastric dilatation

℞ Sodii sulphitis, gr. v ad x.
Sodii bicarbonatis, gr. xv.
Tincturæ nucis vomicæ, ♏xv.
Aquæ ad ℥j.

M. f. haust. To be taken between meals. (*Broadbent.*)

For obstinate flatulence with pyrosis

℞ Argenti nitratis, gr. iv.
Extracti nucis vomicæ, gr. iij.
Extracti lupuli, gr. xxiv.
M. et divide in pil. xij. One thrice a day. (*Barlow.*)

Pills for flatulent dyspepsia

℞ Asafœtidæ, gr. xxiv.
Pulveris rhei, gr. xij.
Olei cajuputi, ♏vj.
Extracti anthemidis, gr. xij.
M. et divide in pil. xij. One or two to be taken at bedtime.

Tonic and antacid in the dyspepsia of the debilitated

℞ Liquoris ammoniæ, ♏lxxx.
Tincturæ aurantii, ℥j.
Infusi chiratæ ad ℥viij.
M. f. mist. Two tablespoonfuls twice or thrice daily an hour before meals.

CHAPTER VIII

TREATMENT OF DISEASES OF THE INTESTINES: ENTERALGIA, OR COLIC

Colic: Causes—Irritating Ingesta—Fæcal Concretions—Worms—Gall-stones—Imprisoned Gases—Cathartic Drugs—Exposure to Cold—Lead—Hysteria—Symptoms and Diagnostic Signs—*Treatment*—Relief of Pain—Opium—Enemata—External Applications—Purgatives—Castor Oil—Calomel—Hypodermic Injection of Morphine and Atropine—Use of Belladonna—Gouty Cases—Alkalis and Colchicum.

Colic in Infants: Food—Enemata—Hot Fomentations—Antacids, Carminatives, and Purgatives—Bromide of Potassium.

Colic due to Cold and Hysteria: Creasote and Menthol in Flatulent Colic—Massage—Quinine in Malarial Cases—Milk Diet.

Neuralgic Colic: Galvanism—Arsenic—Valerianate of Zinc—Warm Clothing.

Lead Colic and Plumbism: Sources of Lead Intoxication—Symptoms—*Treatment*—Prophylactic and Remedial—Aperient Sulphates—Castor Oil—Opium—Enemata—Belladonna—Potassium Iodide.

Saturnine Cachexia: Iron.

Additional Formulæ.

By enteralgia, or colic, is meant all those *painful* affections of the walls of the intestines which are not caused by inflammation or by any structural changes in them. It is an affection of the sensory nerves of the intestine, analogous to gastralgia, or to the neuralgic affections of other sensory nerves. It must, however, be remembered that the same cause which excites a colic may, if it is not removed, produce inflammation.

Enteralgia is not a disease or pathological entity, but rather a group of symptoms of a more or less definite character.

As to the **causes** of enteralgia, they may be of two kinds—first, those which act by setting up irritation of the peripheral ends of the sensory nerves, i.e. causes acting within the intestinal canal itself; and

secondly, causes acting on the sympathetic nerve trunks passing to the intestine, either through reflex excitement, or through physical change in those nerves, as e.g. inflammatory thickening of their sheaths, or any other change which produces an abnormal irritability in them.

A frequent cause of colic is the presence of some irritating substance in the intestine, as indigestible or poisonous articles of food, or mechanical distension as from the passage of gall-stones, of hard fæcal concretions, of masses of intestinal worms (*colica verminosa*). The distension of the bowel by fæcal impaction (*colica stercoracea*) may cause great irritation of the intestinal nerves from pressure on them. The retention of gas (*colica flatulenta*) from constipation is a common cause of colic; "the gas enclosed between an impacted fæcal mass below and a descending mass of fæces above gradually distends this circumscribed portion of bowel and excites severe pains, which, however, disappear as soon as the flatus escapes."* Flatulent colic is, however, more frequently produced by undigested fermenting ingesta, especially in infants; such articles of food, undergoing abnormal decomposition, produce flatulent distension of the bowel and traction upon the intestinal nerves. Mere excess of otherwise wholesome food may cause colic; or the habitual use of food containing some coarse, indigestible particles, as we have seen happen from the long-continued use of coarse brown bread. Unripe fruit, on account of its hard insoluble cellulose, is a frequent cause of colic. Some cathartic medicines, such as "senna," are known to cause colicky pains.

Exposure to cold is a common cause of colic. This is frequently seen in adults after prolonged exposure to cold, or after a severe wetting of the feet. Infants, too, are very prone to this form of colic from undue exposure of the limbs. Iced food and iced drinks will sometimes precipitate an attack.

* Leube, in von Ziemssen's "Cyclopædia of Practical Medicine," vol. vii., p. 460.

A morbid state of the sympathetic nerve trunks, or of their central connections, appears, in other cases, to be the cause of enteralgia, as in those rare instances of attacks of colic associated with disease of the spinal cord, or those connected with uterine, ovarian, renal, and other visceral affections. Lead colic seems to be, to a great extent, of this kind, as distinct anatomical changes have been found in the ganglion and nerve trunks of the sympathetic in some acute cases.

Hysteria, the parent of many forms of neuralgia, is also a cause of intestinal neuralgia.

The **symptoms** of enteralgia vary very greatly in intensity, the pain being in some cases but slight, and in others so severe as to be almost unbearable. The attack will sometimes come on quite suddenly, at other times it may be preceded by nausea, slight griping pains, and flatulent commotion. The pain is usually most severe in the umbilical region, from which it may radiate into the flanks and groins. Firm pressure with the hand seems generally to afford a little relief; sometimes, however, this cannot be borne. When the pain is severe it is accompanied with great restlessness, a pinched and anxious countenance; beads of cold sweat stand out on the forehead, with cold extremities, a slow and small pulse, and great general depression. The abdominal muscles are hard and tense, and participate in the spasm. By placing the hand on the abdomen spasmodic contraction of the intestines may be distinguished in some parts and flatulent distension in others. The attacks of pain are sometimes periodic; they are apt to cease suddenly, with a feeling of complete relief. This often occurs on the discharge of fæces or flatus from the bowels. Usually there is constipation. Other symptoms which may accompany the attacks of intestinal pain are vomiting, hiccough, dyspnœa, desire to micturate, giddiness, faintness, and, in young children, sometimes convulsions. In infants these attacks cause great restlessness, constant crying, and retraction of the limbs.

It is important to be able to distinguish the pain from that of inflammatory affections of the intestinal mucous membrane and disease of the appendix associated with colic. This is not usually difficult; the sudden onset of severe pain, the absence of febrile symptoms, the relief afforded to the pain by firm pressure, the sudden disappearance of the pain on the escape of gas or the passage of a motion, and the history of previous attacks, will usually enable us to arrive at a correct diagnosis. When called to a case of colic, the practitioner should always have in mind the possibility of intestinal obstruction.

In searching for further **indications for treatment** we should note whether the attack has been preceded by vomiting of indigestible food, or by obstinate constipation, or if there is evidence of the presence of nodular masses of indurated fæces in the course of the large intestine; if there is much abdominal distension and commotion from locked-up flatus; if worms have been passed, or symptoms have been complained of pointing to their presence.

The rheumatic nature of an attack may be inferred when it has occurred directly after exposure to damp or chill, and from the absence of other causes.

From commencing peritonitis it may be difficult sometimes to separate it, especially in hysterical women; but the absence of thirst and fever, and the fact that deep pressure is not more painful than light superficial pressure, and the position of the patient —the legs being drawn up and the body kept still in peritonitis, whereas there is often much twisting about of the body in colic—will usually serve to distinguish between them.

If the colic is due to **lead poisoning**, the history will usually disclose this. In a well-marked case the long-continued obstinate constipation, the presence of a blue line on the gums, the loss of power of the extensor muscles of the wrist, the scanty urine, and general dyscrasia are sufficiently characteristic.

With these preliminary considerations we may pass on to the **treatment** of enteralgia.

The **pain** of colic can almost always be relieved by opium, and it is to this drug the practitioner usually at first resorts. This is not, however, always commendable. It must be remembered that opium tends to arrest the intestinal secretions, and especially the outflow of bile; it lessens peristaltic action (one reason, indeed, for giving it), even to the extent, if it is pushed in large doses, of paralysing the muscular coat of the bowel. So that while it relieves the pain it does not remove the cause of the colic, which may be, and frequently is, the presence of offending ingesta or of old fæculent accumulations in the intestines.

It is far better and safer practice, unless we have good reason to know that there are *no* offending substances or fæculent accumulations in the intestine, to administer at once a large enema of warm soap and water (from 1 to 2 pints), with which we should mix 1 or 2 tablespoonfuls of castor oil, and, in cases of flatulent distension, a tablespoonful of spirits of turpentine. If the first enema comes away without affording much relief, another should be given after half an hour. At the same time a hot flannel or linseed poultice sprinkled with laudanum may be applied to the abdomen, or the surface of the abdomen may be rubbed with opium or belladonna liniment, and at the same time gently kneaded with the warm hand in the direction and along the course of the large intestine. There is not the same objection to the external use of opium as there is to its internal administration. If the enema, repeated two or three times, fails to relieve, we may conclude that the large intestine does not contain any fæcal accumulation, an inference which would be corroborated by percussion over the cæcum and colon. In this case we should give some mild cathartic by the mouth, such as a tablespoonful of castor oil, or, if this is rejected by vomiting, 4 or 5 grains of calomel may be

thrown on the tongue, and, if the pain is still severe, a small dose of morphine ($\frac{1}{60}$ or $\frac{1}{8}$ grain) combined with it; or 5 or 10 minims of the liquor opii sedativus may be added to the castor oil, and this dose may be repeated after two hours if necessary.

If the pain is so severe as to point to persistent spasmodic contraction of the small intestine or to some intrinsic lesion of the intestinal nerves, it may be advisable to administer hypodermically $\frac{1}{6}$ to $\frac{1}{3}$ grain of morphine with $\frac{1}{120}$ to $\frac{1}{60}$ grain of atropine.

The use of opium is chiefly valuable for relieving intestinal spasm, and when it does this it may actually promote and assist the action of aperients on the small intestine. It is not, therefore, to this rational use of opium that we object, but to the routine and excessive use of this drug, which we believe not infrequently converts a comparatively unimportant colic into a serious case of obstruction, by paralysing abdominal movements. It is best, therefore, to cure an attack of colic without opium, if possible, and in that case the cure (with evacuants) will be speedy and complete.

It has been objected that aperients in these cases are apt to increase intestinal spasms, especially if given alone, but this objection cannot apply to enemata, with which the treatment of these cases should always be begun.

In cases where there is great intolerance of pain, one initial dose of opium (or a hypodermic injection of morphia) may be given at the same time that efforts are made to evacuate the bowels by enemata.

There is not the same objection to the use of belladonna and atropine in these cases as there is to that of opium and morphine; there is reason to believe that atropine lessens or removes the irritability of the intestinal nerves, and so relieves intestinal spasm as completely as opium, without locking up the contents of the bowel and arresting biliary and other intestinal secretions, as opium does. We may, there-

fore, prescribe a warm carminative mixture containing belladonna, such as :—

℞ Tincturæ belladonnæ ... ... ℥ss.
Tincturæ cardamomi compositæ ... ... ℥ vj.
Spiritus ammoniæ aromatici ... ... } āā ℥ij.
Spiritus chloroformi ... ... }
Sodii bicarbonatis ... ... ℥j.
Aquæ carui ... ... ad ℥vj.

Misce, fiat mistura. Two tablespoonfuls every hour until relieved.

At the same time we should give enemata. Or we may at once give $\frac{1}{60}$ grain of atropine hypodermically.

In cases which appear to be of a **gouty** nature, i.e. occurring in persons who are known to be the subjects of gouty manifestations, we must give warm alkaline medicines and an aperient pill with colchicum each night for a few nights, as the following :—

℞ Ammonii carbonatis ... ... gr. xl.
Sodii bicarbonatis ... ... gr. lxxx.
Spiritus chloroformi ... ... ℥iij.
Tincturæ zingiberis ... ... ℥j.
Aquæ cinnamomi ... ... ad ℥viij.

Misce, fiat mistura. Two tablespoonfuls with one of hot water every three or four hours.

℞ Extracti colchici ... ... gr. ss.
Pilulæ rhei compositæ ... ... gr. iv.
Fiat pilula. To be taken every night.

In infancy the colic is very frequently caused by the undigested curd of cow's milk or by unduly irritating acid contents of the intestine from abnormal decomposition of food, and this is accompanied with painful distension of the intestines with flatus. This is frequently traceable to excess of starch in the food. Preventive treatment consists in adapting the food to the digestive power. Cow's milk may be peptonised, or treated with citrate of soda (1 grain to the ounce). Alternate feeds of peptonised milk and whey may be substituted for the plain milk. The milk must be given slowly, and care taken that air is not gulped down along with it. Such cases are best

relieved by an antacid aperient and carminative mixture such as the following :—

℞ Pulveris rhei compositi ... ... ʒj.
Spiritus ammoniæ aromatici ... ... ʒss.
Tincturæ cardamomi compositæ ... ... ʒiij.
Spiritus chloroformi ... ... ʒss.
Aquæ carui ... ... ad ʒjss.

Misce, fiat mistura. A teaspoonful or two, according to age, every hour until relieved.

At the same time the infant should be given an enema of simple hot water at the temperature of the body, or hot flannels should be applied to the abdomen. Special attention should be paid to warmth of the limbs.

If there is decided constipation, or evidence of continued fermentation, a dram or two of castor oil may be given, or a grain of calomel may be thrown on the tongue and washed down with the first dose of the above mixture; and if there seems to be much painful spasmodic contraction of the intestine, half a grain or a grain, according to the age of the child, of compound ipecacuanha powder should be mixed with the calomel; that would be $\frac{1}{20}$ or $\frac{1}{10}$ grain of opium. If there should be a difficulty in getting the child to take medicine by the mouth, a clyster containing an emulsion of castor oil and a little oil of rue should be thrown up into the bowel. The following is a suitable formula :—

℞ Olei ricini ... ... ʒj ad ʒiij.*
Olei rutæ... ... ... ♏ij ad ♏vj.
Potassii carbonatis ... ... gr. v ad xv.
Aquæ ... ... ad ʒij ad ʒiv.

* According to the age of the child.

This must be given with a rather long tube, or it may not be retained. If, after free evacuation of the bowels, there is still pain and distress, 1 or 2 minims of tincture of opium (if the child is over six months) may be given in 1 or 2 ounces of starch emulsion as an enema.

Ringer speaks of a form of colic in young children which is only relieved by bromide of potassium; the belly is retracted and hard, or the intestines "at one spot are visible, contracted into a hard lump, the size of a small orange," which can be felt "travel ling from one part of the intestine to another." These attacks are, he says, "unconnected with constipation, diarrhœa, or flatulence." They cause "excruciating pain," and are sometimes "associated with a chronic aphthous condition of the mouth." Two to 5 grains of bromide of potassium or sodium may be given every hour in a dram of dill-water.

In attacks of colic due to **chill**, or of a rheumatic nature, hot applications to the surface of the abdomen are most useful, hot flannels sprinkled with turpentine, or hot linseed-meal or bran poultices, after friction with opium or belladonna liniment. Warm drinks are also useful to promote diaphoresis, such as a breakfastcupful of gruel with a tablespoonful of brandy. A full dose of Dover's powder, 10 to 15 grains, should be given at bedtime, and some mild saline aperient the next morning, such as sodium sulphate or phosphate, one or two teaspoonfuls, in half a tumblerful of hot water every hour until the bowels are relieved. A flannel band should be always worn round the abdomen to prevent recurrences of the attack. In chronic cases of this kind iodide of potassium or salicine may be found useful.

In **hysterical** cases, usually attended with great flatulent distension, antispasmodic enemata are very serviceable, in combination with aperients. Four ounces of the *enema asafœtidæ* may be mixed with 4 ounces of the *enema aloes* and 4 ounces of warm soap and water, and administered with a long tube; or an enema may be made with 5 minims of oil of rue mixed with 2 drams of ammoniated tincture of valerian, and then added to 10 ounces of warm infusion of valerian. One or two drops of cajuput oil on a lump of sugar may be taken internally to

relieve flatulence. Five grains of the aloes and asafœtida pill may be given night and morning; or, better still, a pill containing 1½ grains of powdered aloes, 1 grain of asafœtida, 1 minim of oil of cloves, and 1 grain of powdered soap.

If we have evidence that the colic is caused by **intestinal worms,** we must give the remedies necessary for their displacement.

One of the best remedies for slight but habitual flatulent colic is creasote or menthol; either of these remedies given immediately or soon after food prevents undue fermentation and development of gas. Half a minim of creasote or 1 grain of menthol may be made into a pill with 2 grains of powdered rhubarb and 1 of soap, and taken after each meal. Abdominal massage is also useful in these cases. In cases that can be distinctly traced to malarial influence quinine in full doses must be given; or arsenic if quinine cannot be tolerated.

A strict milk *diet* will cure some obstinate cases by removing all possible sources of irritation from imperfect digestion of food.

In the purely **neuralgic** cases more difficulty will be encountered in obtaining speedy relief. The anodyne remedies already mentioned will, in most cases, afford temporary relief, but for permanent cure we shall probably be obliged to have recourse to other means.

The general indications for treatment applying to other forms of neuralgia will apply in these cases also. Galvanism has proved very useful, and is highly commended by Leube, especially for the relief of meteorism. Arsenic has been strongly recommended, especially by Sir Clifford Allbutt, in the treatment of neuralgic colic.

Valerianate of zinc, 1 grain three times a day, has proved useful in enteralgia arising reflexly in connection with uterine disease.

Persons prone to attacks of colic should be particularly observant of their diet, and carefully avoid those

articles of food which appear to predispose to the attack. They should also clothe warmly, and wear a flannel belt round the abdomen; they should avoid sedentary habits, as well as any great fatigue or exhausting efforts, bodily or mental, and they should never suffer the bowels to become constipated.

The management of cases of **lead colic** requires special consideration.

Although lead colic as well as other symptoms of lead poisoning occur incidentally and occasionally from the introduction of lead compounds into the body in water, food, alcoholic beverages, hair dyes, snuff, etc., yet it is chiefly amongst the workers in lead factories that its severe characteristic forms are so frequently encountered.* Legge and Goadby have adduced much evidence to show that lead is more prone to be absorbed by the lungs than by the alimentary tract. Where dust is abundant, they find that lead poisoning is common, but rare where it is not so. Plumbers and painters, also, from the necessity in their occupations of coming much into contact with lead, are prone to suffer from plumbism. Whenever we encounter the symptoms of lead poisoning, in others than those who are known to be brought into contact with this metal, or its compounds, in their occupation, it is necessary to make a very close inquiry—first, into the source of their water supply, and, if this is found free from all possible contamination, secondly, into the sources and modes of preparation of all the articles of food and drink consumed. Wine, cider, sour milk, beer, ginger-beer, lemonade, hair dyes strongly impregnated with lead, have all at times been found to give rise to lead colic. Flour, bread, and cakes have also been found to contain lead, and to give rise to plumbism.

The **symptoms** of acute lead colic are thus described by Oliver: †—

"The patient is suddenly seized with an acute

* "Lead Poisoning and Lead Absorption." 1913.

† "Lead Poisoning in its Acute and Chronic Form."

pain in the abdomen. Confined to the region of the umbilicus, sometimes a little above it, but more frequently to the left, the pain is either of a twisting or grinding nature, or it creates a sense of weight and constriction. These pains are simply excruciating. Sometimes the patient receives relief from pressure, sometimes from warmth; at other times he is unable to be touched. The colic subsides, only to recur in paroxysms, and with a tendency to nocturnal exacerbation. Generally, after the acuteness of the pain has subsided, nausea, retching, or vomiting of a thin, greenish liquid occurs, accomplished with difficulty, and accompanied by restlessness. The secretion of the urine is diminished, and the pulse is hard and slow. In such a case under treatment, the pain, gradually subsiding in severity, keeps returning in milder and milder paroxysms; the vomiting abates, the bowels yield to purgatives, the spirits improve. In a few days the patient is convalescent." Together with, or consequent upon, these painful abdominal symptoms we observe other general symptoms of plumbism—pallor and sallowness of the complexion with anæmia, pinched features, a small, rapid pulse, a characteristic blue line on the gums, a metallic taste in the mouth, headache, weakness in the limbs, sometimes extreme wasting of the extensor muscles of the hands and "*dropped wrists*," loss of appetite, and most obstinate constipation. With other symptoms of plumbism we are not at present concerned.

The **treatment** of lead colic may be prophylactic or remedial. For the former purpose we should carefully see that in the storage and conveyance of drinking-water it should come into contact not at all, or as little as possible, with the metal lead, nor should any ordinary foods or beverages be stored up or wrapped in leaden receptacles or envelopes. When it has been found impracticable to prevent altogether the contact of drinking-water with lead, the addition of carbonate of lime in the proportion of 2 grains to the gallon causes a protective coating to form on the

interior of the pipe, and the risk of lead poisoning is thus greatly diminished, or wholly prevented. Silica acts in the same way. Persons employed in lead factories should be regularly examined for symptoms of plumbism, and when any of these are detected those persons should at once be suspended from work. As in white lead works the powder enters the body commonly by inhalation through the respiratory organs, or from want of cleanliness in feeding, the powder collecting on the hands being conveyed with the food into the mouth, obvious precautionary measures are to insist on the operatives wearing suitable respirators, and bathing the body, and especially carefully washing the hands before taking food. Sulphuric acid lemonade, a drink acidulated with sulphuric acid and sweetened with sugar, or a drink of sulphate of magnesia (!) acidulated with sulphuric acid, is kept in most lead factories, and the workers are encouraged to drink it in the belief that any soluble compounds of lead that might reach the stomach would be thus converted into the insoluble sulphate, and so be rendered harmless. Such drinks certainly have a preventive influence, but the workers cannot be induced to drink them as freely as desirable. This can readily be understood if the bitter and unpleasant sulphate of magnesia is added to them. Sulphur lozenges are also a serviceable preventive remedy.

Oliver * considers "that no man or woman should be allowed to begin the toil of the day without having had a substantial meal, experience and experimental investigation having shown that during the process of digestion little or no lead is dissolved and absorbed." He also thinks that "total abstinence is a physiological necessity" to lead workers. Milk should be taken freely with the food.

The **medicinal** treatment must correspond to the following indications: (1) To relieve the constipation and pain; (2) to promote the elimina-

* *Op. cit.*

tion of the lead from the body, and to remove its constitutional effects. In response to the first indication, it is usual to give the aperient sulphates in combination with sulphuric acid, for not only do they, as purgatives, relieve the constipation, but as sulphates they precipitate any soluble salts of lead there may be in the intestinal canal in the form of the insoluble sulphate. Castor oil also may be given, but the sulphates are preferable. Should the pain be very severe, a hypodermic injection of morphine ($\frac{1}{4}$ grain) and atropine ($\frac{1}{60}$ grain) may at the same time be given; or an opiate and belladonna liniment (lin. opii, lin. belladonnæ, āā $\frac{1}{2}$ ounce) may be rubbed in freely round the navel, or a large warm enema of soap and water, one or two pints, may be given, with which 1 ounce of castor oil, $\frac{1}{2}$ an ounce of turpentine, and 20 minims of laudanum should be mixed. Hot fomentations should be applied to the abdomen. If there is troublesome vomiting, it is more likely to yield to a hypodermic dose of morphine than to gastric sedatives administered by the mouth.

The following mixture of aperient sulphates may be prescribed:—

℞ Magnesii sulphatis ... ... } āā ℥jss.
Sodii sulphatis ... ... }
Acidi sulphurici aromatici ... ... ℥j.
Syrupi zingiberis ... ... ℥ss.
Aquæ cinnamomi ... ... ad ℥xij.

Misce, fiat mistura. Four tablespoonfuls every hour until the bowels are completely relieved.

The action of this mixture should be aided by large enemata if necessary. The aperient doses may be repeated as required.

Belladonna has been found very efficacious in the relief of lead colic by some physicians. Small doses ($\frac{1}{6}$ to $\frac{1}{4}$ grain of the extract) should be given frequently, every hour or half-hour, and the doses should be increased until the full physiological effect of the drug is established; or the tincture may be added to the above aperient mixture.

Rectal injections of ether vapour have been found useful in lead colic. An indiarubber tube is passed into the rectum and connected with a flask containing ether, which is placed in hot water. Relief is usually obtained after the vapour of about 15 minims of ether has passed into the bowel. A dose of castor oil should then be given.

To fulfil the second indication, viz. to procure the **elimination** of the poison, potassium iodide must be given. This salt forms a soluble compound with the lead deposited in the tissues, which is then reabsorbed into the blood, and eliminated by the kidneys. The presence of lead in the urine may be detected soon after the administration of the iodide. It may be combined with sulphate of magnesia.

The following is an excellent formula, to be prescribed after the relief of the severe colic :—

℞	Potassii iodidi	gr. xl.
	Magnesii sulphatis	ʒj.
	Tincturæ nucis vomicæ	ʒij.
	Aquæ cinnamomi ... ... ad	ʒviij.

Misce, fiat mistura. Two tablespoonfuls night and early morning.

So rapid is the solvent action of the iodide in many cases that Oliver calls attention to a certain amount of risk attending its use when there is a large amount of lead deposited in the tissues ; he has known the general symptoms of plumbism to increase under its influence, and sudden death to occur, "due in great measure to the rapid entrance into the blood of a large amount of soluble lead salt." Caution must, therefore, be observed in its use.

For removal of the cachectic anæmia, the so-called **saturnine cachexia,** nothing is better than a prolonged course of perchloride of iron combined with a sufficiency of sulphate of magnesia to ensure a regular daily evacuation. The special measures called for in the treatment of paralysis due to absorption of the metal are described in Part VII, under the heading of Multiple Neuritis.

ADDITIONAL FORMULÆ

For colic

℞ Pulveris rhei, ʒss.
Tincturæ rhei, ʒiij.
Magnesii carbonatis, ʒj.
Tincturæ opii, ♏xv.
Spiritus anisi, ♏vj.
Spiritus menthæ piperitæ, ʒij.
Aquæ ad ℥vj.

M. f. mist. A tablespoonful three times a day. (*Naphey.*)

For flatulent colic

℞ Spiritus chloroformi
Tincturæ cardamomi compositæ ana ʒj.

M. f. mist. A teaspoonful every half-hour in water.
(*Bartholow.*)

For the pain of colic

℞ Chloroformi, ʒj.
Morphinæ acetatis, gr. jss.
Olei anisi, guttas vij.
Olei menthæ piperitæ, guttas viij.
Syrupi acaciæ, ʒij.
Aquæ camphoræ ad ℥ij.

M. f. mist. A teaspoonful for a dose. (*Ludlow.*)

Enema for flatulent colic

℞ Olei terebinthinæ, ℥j.
Pulveris amyli, q.s.
Decocti hordei ad ℥xx.

M. f. enema. (*Hooper.*)

For colic and restlessness in infants

℞ Potassii bromidi, ʒj.
Olei anisi, ♏ij.
Mucilaginis acaciæ, ʒij.
Aquæ menthæ piperitæ ad ℥ij.

A teaspoonful every half-hour until relieved.

Aperient draught for colic

℞ Olei ricini, ʒvj.
Tincturæ rhei, ʒij.
Tincturæ opii, ♏xx.
Aquæ cinnamomi ad ℥ij.

M. f. haust. To be taken immediately. (*Whitla.*)

For flatulent colic in women

℞ Spiritus ammoniæ aromatici, ʒiij.
Spiritus chloroformi, ʒij.
Tincturæ zingiberis, ʒij.
Tincturæ belladonnæ, ʒj.
Aquæ menthæ piperitæ ad ℥xj.

M. f. mist. Two tablespoonfuls every four hours.
(*Therap. Gaz.*)

Draught for flatulent colic with constipation

℞ Olei cajuputi, ♏iv.
Sacchari albi, gr. x.
(Tere et adde)
Tincturæ jalapæ, ʒj.
Decocti aloes compositi ad ℥jss.

M. f. haust.

For infantile colic

℞ Magnesii carbonatis, gr. xx.
Syrupi zingiberis, ʒiij.
Spiritus chloroformi, ♏xx.
Aquæ anethi ad ℥ij.

M. f. mist. A teaspoonful every hour if necessary.

For severe colic in infants

℞ Tincturæ cascarillæ, ♏x.
Tincturæ krameriæ, ♏x.
Olei anthemidis, guttas j ad ij.
Syrupi simplicis, ʒijss.
Aquæ ad ℥ij.

M. f. mist. A teaspoonful every two hours.
(*Prof. Widerhofer, Vienna.*)

For colic from impacted fæces

℞ Strychninæ, gr. j.
Extracti belladonnæ, gr. iv.
Podophyllin, gr. iv.
Pulveris ferri sulphatis, gr. xx.
Aloes socotrinæ, gr. xx.
Syrupi, q.s.

M. et divide in pil. xx. One every eight hours.
(*Montgomery.*)

Mixture for infantile colic

℞ Spiritus ammoniæ fœtidi, ♏x.
Olei anisi, ♏iv.
Tincturæ opii, ♏iv.
Magnesii carbonatis, gr. xx.
Pulveris rhei, gr. x.
Syrupi simplicis, ʒj.
Aquæ ad ℥ij.

M. f. mist. One or two teaspoonfuls every three hours.
(*Brereton.*)

Enema asafœtidæ

℞ Asafœtidæ, 30 grains.
Distilled water, 4 oz.

Rub the asafœtida with the water, added gradually so as to form an emulsion, for one enema.

Alum mixture for lead colic

℞ Aluminis, ʒij.
Acidi sulphurici diluti, ʒj.
Syrupi limonis, ℥j.
Aquæ ad ℥iv.

M. f. mist. A tablespoonful every hour or two. (*Bartholow.*)

For the constipation of lead colic

℞ Magnesii sulphatis, ℥j.
Acidi sulphurici diluti, ʒj.
Aquæ ad ℥iv.

M. f. mist. A tablespoonful every three hours. (*Bartholow.*)

Mixture for flatulent colic

℞ Magnesii levis, ʒss.
Olei cajuputi, ʒss.
Spiritus ammoniæ aromatici, ʒij.
Tincturæ cardamomi compositæ, ʒiv.
Aquæ ad ℥vj.

M. f. mist. One or two tablespoonfuls for a dose (one or two teaspoonfuls for a child).

Enema aloes

℞ Aloes, gr. xl.
Carbonate of potassium, gr. xv.
Mucilage of starch, ℥x.
Mix for one enema.

CHAPTER IX

TREATMENT OF DISEASES OF THE INTESTINES: HABITUAL CONSTIPATION

Causes—Faulty Dietetic Habits—Insufficient Ingestion of Water—Defective Secretion of Bile—Loss of Muscular Tone in the Intestinal Walls—Negligence to solicit Action of Bowels—Symptoms—Dyspeptic Troubles—Headache—Defective Nutrition—Depression of Spirits—Restlessness—Pressure Symptoms—Circulatory and Neurosal Disturbances—*Treatment* (1) *Dietetic* — Water — Fresh Vegetables and Fruits — Oatmeal, etc.—Fats and Oils—Grapes—Linseed—(2) *Regiminal*—Exercise—Gymnastics—Massage—Cold Affusions and Local Douches—Electricity—Abdominal Belt—(3) *Medicinal: Occasional Constipation*—Saline and other Purgatives—Enemata — Mechanical Removal of Indurated Masses—Glycerine — Soap — *Biliousness* — Cholagogues — Calomel — Podophyllin — *Habitual Constipation*—Dinner Pills — Vegetable Laxatives—Senna—Cascara—Aloes—Agar-Agar—Paraffin—Purgative Waters—Saline Aperients—Spa Treatment — Belladonna — Opium — Iron — Nux Vomica—*Operative Measures:* Short-circuiting — Colectomy — Appendicostomy —Additional Formulæ.

CONSTIPATION, for our present purpose, must be regarded simply as an abnormally prolonged retention of the fæces, or their habitual expulsion with difficulty and in defective quantity; and this is usually accompanied by more or less disturbance of the general health.

In considering the **causes** of habitual constipation with a view to its successful treatment, we must, *in the first place*, point out how often it depends on faulty **dietetic habits,** especially in the addiction to too highly concentrated foods, and to the too sparing use of water. A diet insufficient in quantity, or composed almost exclusively of easily digested animal food, will leave but little waste as a result of its digestion, and so produce constipation by not supplying that stimulus to the nerves of the intestinal mucous membrane which a normal amount

of indigestible residue would do. Prolonged use of artificially digested foods is apt to produce this effect in infants. Constipation may also follow the use of articles of food leaving too highly stimulating a residue, the repeated contact of which finally exhausts the excitability of the intestinal walls. Often too **dry** a diet may be the cause of constipation; the water taken being in insufficient quantity to keep the contents of the intestinal canal in a fluid, semi-fluid, or soft condition; the freer also the supply of water to the blood the more abundant and fluid the intestinal secretions are likely to be; whereas a defective supply of water will naturally diminish the amount of the fluid secreted by the intestinal glands. A comparatively dry condition of the intestinal canal is thus induced, and the progress of the residue of the food along it is thereby retarded.

The same result will follow the excessive loss of fluid through the skin, kidneys, or lungs, if this loss be not compensated for by an adequate increase in the water ingested. Excessive muscular exertion, or exercise, in persons disposed to perspire freely, may thus contribute to the constipated habit, and we must bear this in mind when prescribing exercise for its cure, or in ordering Turkish baths. Diabetes, and certain nervous states attended with an excessive flow of urine, hyperlactation causing a loss of water from the blood through the mammary glands, and feverish states, which increase both cutaneous and pulmonary transpiration as well as lessen intestinal secretion, all tend to produce constipation.

An exclusively milk diet, as well as so-called "fasting" cures, causes constipation by leaving an insufficient residue to excite intestinal peristalsis. Too great uniformity in diet will tend to have the same effect by leading to diminished sensibility of the intestinal canal.

Secondly: Deficiency of the intestinal secretions—of bile and intestinal juices—irrespective of dietetic habits, may cause habitual constipation. In many

persons there would seem to be a constitutional tendency to defective secretion of bile and the intestinal juices, just as in others there is a tendency for the cutaneous secretion to be defective.

Thirdly: Chronic constipation may be due to a want of tone, a loss of muscular propulsive power, in the intestinal walls, either from defective nutrition, or imperfect innervation, or from intrinsic structural changes. Under this head we include the cases which depend on bodily inactivity and insufficient exercise in the open air, associated with sedentary habits or too exclusively intellectual occupations, or arising from various other causes. Hysterical, anæmic, and hypochondriacal states, although often, to some extent, effects of constipation, may also contribute to cause this state by the defective innervation and nutrition of the muscular system generally which they induce. Weakness of the abdominal muscles, such as is present soon after pregnancy, is also at times a cause of troublesome constipation. We may also here include the cases of constipation dependent on paralysing lesions of the spinal cord, which affect not only the motor nerves of the intestinal canal, but also those of the abdominal muscles.

Or the loss of tone may depend on structural changes in the intestinal walls; as an œdematous condition from chronic renal or cardiac disease, or degeneration or wasting of the muscular coat, as in convalescence from exhausting fevers, and in the cachexia of many chronic diseases, as well as in senile degeneration.

Fourthly: A common cause of chronic constipation is a habit of indolence or carelessness in neglecting to solicit a regular periodical evacuation of the bowels. The natural impulse to defæcation is at first disregarded, the sensibility of the rectal mucous membrane is thereby blunted, considerable accumulations occur in the rectum and sigmoid flexure of the colon, and many days often pass without a stool. Women are especially addicted to this injurious habit.

Fifthly : Constipation may be induced by unwillingness to defæcate owing to painful local conditions, such as fissure, inflamed hæmorrhoids, ulceration of the lower bowel, or pelvic disease ; and spasm of the sphincter ani in infants and children. It has been pointed out that women are more prone to constipation than men, not only on account of their more sedentary habits and indolent disregard of the calls of nature, but also from organic causes.

Habitual constipation is often accompanied by a disagreeable train of **symptoms,** which may here be briefly enumerated (some of these are probably due to the mechanical and obstructing effects of the retained fæces, and others to the absorption into the blood from the intestinal surface of toxic substances resulting from putrefactive changes in the retained excrement) : Loss of appetite, coated tongue and bad taste in the mouth, impaired digestion, flatulent distension and oppression causing palpitation and dyspnœa, defective nutrition, wasting and anæmia, headaches, flushing of the face, spots before the eyes, great depression of spirits and irritability of temper, the sleep disturbed by dreams and the nights restless. Cutaneous eruptions sometimes appear.

Owing to local pressure of the retained fæces on the vessels and nerves in the neighbourhood of the rectum and sigmoid flexure, we may, occasionally, get œdema of the feet (from pressure on the iliac veins), but more commonly cold feet, hæmorrhoids (from pressure on hypogastric veins); men may have troublesome erections and seminal emissions (from pressure on the pudic veins), and sciatica, and neuralgic pains in the legs, and a feeling of numbness due to pressure on the nerves of the sacral plexus. A feverish state is not uncommonly induced in some cases of habitual constipation ; the temperature rises to 101° or 102° F. (some physicians have observed much higher temperatures) ; with this rise of temperature there are usually a dirty tongue, a bad taste in the mouth, high-coloured urine, complete loss of appetite, and great physical

and mental depression. These symptoms are, no doubt, caused by the absorption of toxins developed in the retained fæces. The fever may last a considerable time, even if the bowels are well acted upon, and the loss of appetite often lasts much longer.

The **treatment** of habitual constipation must respond to the following indications :—

1. A suitable regulation of the diet and regimen.
2. An enforcement of healthy habits of life.
3. The adoption of such remedial measures (medicinal or other) as shall immediately overcome the existing constipation, and prevent its recurrence ; the latter by improving the digestion, promoting intestinal secretions, and giving tone to the intestinal walls.

1. As to **diet.** When we have reason to think an insufficient amount of water is taken, that deficiency must be supplied. A tumblerful of water, hot or cold, according to the season of the year, should be drunk slowly while dressing in the morning, again on going to bed at night, and half an hour before dinner—the latter may, preferably, be taken hot. This water should be as free as possible from lime-salts ; slightly mineralised effervescing waters will also serve the purpose, such as Seltzer water or Apollinaris water. Beverages containing tannin should be avoided—such as certain red wines, strong tea, etc. It is on this account that China teas are so much more wholesome than Indian and Ceylon teas, which contain a much larger amount of tannin. The substitution of wine for water with meals is apt to lead to deficiency of fluid. Brown or rye bread, fresh vegetables—rhubarb, spinach, sorrel, beetroot, watercress, salads, plainly boiled Spanish onions—and ripe fruits should form a regular part of the diet ; plums, prunes, grapes, figs, baked apples, stewed pears, peaches, oranges, bananas—foods leaving a considerable amount of undigested residue of cellulose, which exercises a stimulating action on the intestinal walls, and increases the

bulk of the fæces. But it is an error to irritate the bowel by too large quantities of coarse and indigestible substances. The amount of animal food should be limited, and the proportion of vegetable food increased. An excess of eggs, milk, and farinaceous foods, as they leave but little indigestible residue, must be avoided. Although milk by itself is constipating, it is much less so when mixed with coffee, and the stimulating influence of a cup of *café au lait* on rising in the morning will often produce a laxative effect: or a small cup of coffee may be taken with cream and sugar. For infants, barley-water may be added to the milk. Maize and oatmeal are slightly aperient, and may be taken with advantage. Infants are often constipated from deficiency of sugar or fat in the milk. Honey and treacle are also slightly laxative, and may be taken with oatmeal porridge or with brown wholemeal bread. Gingerbread which is made with honey is decidedly laxative. Honey and jam or marmalade, eaten with bread, are good for this purpose. A due proportion of fats and oils is also beneficial, as to some extent they escape digestion in the small intestine, and serve to lubricate and soften the fæculent mass which passes into the large intestine. Plenty of fresh butter is, therefore, useful, and so, too, is olive oil taken freely with salads; or a dessertspoonful of this oil may be mixed with potato, beetroot, or other vegetable at meals. The various preparations of "sour milk" prove laxative to some patients. The laxative effect of 4 to 6 lb. of grapes taken as a "grape cure" daily has been found of value in overcoming chronic constipation. Orange juice and prune juice are useful laxatives for small children.

Linseed—such as linseed-tea is made with—has been recommended by some French physicians as a good remedy for habitual constipation. A little water is poured on a dessertspoonful or tablespoonful of linseed, allowed to stand for one hour, and the whole drunk immediately before a meal.

When from defective appetite or painful digestion an insufficient quantity of food is taken to yield the necessary stimulus to peristaltic contraction in the intestinal canal, measures must be directed to removing the dyspepsia and sharpening the appetite.

2. The enforcement of **healthy habits** of life is of great importance. Physical inactivity, from indolence or from too studious habits, or from too assiduous devotion to sedentary occupations, is a fruitful cause of habitual constipation, and in all such cases an adequate amount of regular exercise should be insisted upon.

Bodily exercise is a means of exciting peristaltic action in most persons (provided it is not attended by such profuse perspiration as to lead to an excessive loss of water by the blood). Respiration is thereby accelerated, the action of the diaphragm and abdominal muscles is increased, and the circulation of the blood promoted; at the same time the tone of the intestinal muscles is improved, and in this way peristaltic action is quickened. Riding, rowing, hill-climbing, walking, and the usual outdoor games afford a full variety for selection. Infants must be allowed free mobility of their limbs.

The influence of bodily exercise may be aided by methodical abdominal massage and suitably devised indoor medical gymnastics. Those who desire to carry out such exercises systematically at home will find suitable exercises, together with directions for their performance, described in any of the numerous manuals on the subject.*

The following is the method that should be pursued in applying abdominal massage for the cure of constipation: Begin by kneading the abdominal integuments and muscles, pressing gently over the cæcum with the tips of the fingers (palmar surfaces); then, by means of the closed fists, or with infants the thumb, we should apply gentle but deep massage along the whole course of the colon. The patient

* Schreber's "Medical Indoor Gymnastics" is full and explicit.

should empty the bladder beforehand, and the process should not last longer than from fifteen to twenty minutes each time.

The medical attendant should at first apply or, at any rate, supervise this massage himself, as it is important that the operator should know the course and relations of the colon so as to apply pressure in the right direction; otherwise more harm than good may result from abdominal massage.

Vibratory massage is also useful.

The importance of soliciting a daily action of the bowels at a given hour, and avoiding all haste, should be in all cases pointed out. This is particularly necessary with young girls at the age of puberty, when they are apt to be very neglectful in this respect, and so lay the foundation of much future trouble through inattention to the daily evacuation of the bowels. A busy man may often find it convenient to accustom himself to an evening hour that is less liable to interruption. The daily habit of cold sponging, or bathing, with friction of the surface, is of much use, and this may be reinforced by cold douches or cold affusion, or the application of cold compresses to the abdomen. Prof. Turck has suggested ice-massage of the abdomen, to be applied after the patient has taken a hot bath—as hot as he can bear. The whole of the abdomen is then rubbed and massaged with a cake of ice placed in a suitable rubber-bag. The stomach, intestines, and solar plexus are thus powerfully stimulated. Measures of this kind, when persevered in, have proved successful in curing obstinate cases of constipation, especially when dependent on atony of the intestine.

Perineal and anal douches have also proved useful by exciting locally the muscles of defæcation.

Any habitual pressure from tight clothing round any part of the abdominal cavity should be rectified.

We are not greatly in favour of electrical treatment, unless in very obstinate cases with fæcal retention that cannot be relieved by other measures. This

mode of treatment has seemed to us to make patients far too dependent on its continued application, and to foster that morbid introspective attention to their bodily sensations to which they are already too prone, and which is, in itself, a malady. Where, however, the constipation seems to depend on feebleness of the abdominal muscles and great loss of intestinal tone, the regular application of the interrupted current may be of use in promoting their better nutrition. In such cases, especially after repeated pregnancies, the wearing of a well-fitting elastic abdominal belt should be insisted upon. High-frequency currents are sometimes beneficial in the relief of constipation, more because of their general tonic effect than for any special local action.

3. Finally, we have to consider the **medicinal** measures that may be effectual in curing constipation. *Accidental* or *occasional* constipation is usually readily overcome by some simple aperient dose. One of the most effectual is a pill composed of $\frac{1}{2}$ grain of calomel, 2 grains of extract of aloes, and 1 grain of extract of henbane, to be taken at bedtime, and 2 drams of sodium sulphate or phosphate in a tumblerful of hot water the first thing the following morning. This is a very effectual dose, which rarely causes any griping and relieves the bowels completely. A seidlitz powder in a large tumblerful of cold water early in the morning for the next few days will usually be all that is needed to restore regularity to the bowels in such cases of occasional and accidental constipation.

Castor oil is another useful aperient drug for occasional use, and has the advantage of acting, as a rule, quickly. From $\frac{1}{2}$ to 1 tablespoonful may be given as a dose, according to the age or susceptibility of the patient, in warm milk or a little brandy and water.

The medicinal treatment of *habitual* constipation is, however, more difficult. Whenever it is easy or possible to overcome the habit of constipation by simple measures without recourse to drugs, these

should certainly be avoided; but in very many cases it will undoubtedly be necessary to use some medicinal aids to initiate a more healthy action of the bowels, and no good can arise from needlessly alarming patients about the injurious effects of laxatives.

At the outset, then, it is most important completely to clear the intestinal canal of all fæcal accumulations, and to ascertain by suitable manipulation that the large intestine, throughout its entire course, is thoroughly emptied and contracted, and not the seat of dry and hard retained fæcal masses. For this purpose such a dose as we have just suggested may be given for three or four consecutive days, or until by examination of the motions and by palpation and percussion of the abdomen we are satisfied that no fæcal accumulations have been left behind. If, however, we perceive evidence of hard lumps remaining in the large intestine, or if small, dry, light concretions float on the surface of the fluid evacuations, we must wash out the large intestine by **enemata.** The enemata must be administered by means of a long tube, connected with a douche can, so as to obtain a continuous stream in place of the interrupted flow of the ball-syringe, which makes it difficult to retain the water; and the patient must be placed on his left side, or, better still, in the kneeling posture, with his head and shoulders depressed and the buttocks elevated; in this position the fluid will flow of its own weight into the large intestine, and remain long enough to soften old, hard, dry fæcal concretions which may be retained there. Each enema should be retained for ten to fifteen minutes. The enema may be best composed of warm soap and water (temperature about 100° F.), from a pint to a pint and a half or two pints, according to the capacity of the colon. Some recommend the introduction of much larger quantities of water into the colon, for purposes of irrigation, than those we have mentioned. Such very copious

irrigations may be advisable in certain cases, but they must be used with great caution, and always by the medical attendant himself. The enema, which is simply for the purpose of washing out the colon and softening any hard concretions that may be in it, should be given daily until we are satisfied it has accomplished the purpose for which it was ordered. In very chronic and obstinate cases it will be advisable to continue the daily use of an enema (in the same position of the body), which should now consist either simply of a pint of tepid water, or a pint of tepid water with a teaspoonful of common salt and half a teaspoonful of sodium bicarbonate dissolved in it. This daily use of such a tepid enema for some months, together with a properly regulated diet and a daily dinner pill (preferably immediately before dinner), consisting of 1 or 2 grains of extract of aloes, ½ grain of powdered ipecacuanha, ½ grain of extract of nux vomica, and a grain of soap, we have seen completely restore the health of those who have ailed for years in consequence of chronic constipation.

In old, bedridden, and paralysed people it is not unusual to find in the rectum very large accumulations of hard fæces which no enema tube can penetrate; in such cases it is necessary to give an anæsthetic, and, by means of the finger, mechanically to dislodge from the rectum as much of this accumulation as can be reached, and later to use softening enemata until the large intestine is thoroughly emptied, and to continue the daily use of an enema to prevent future accumulations. In cases like these, as it may be impossible to place the patient in the kneeling posture, he may be turned over on his left side, or the buttocks may be raised by placing a hard hair-pillow under them; unless some contrivance of this kind is adopted, or a very long tube used, it will be found that the enema is often immediately rejected, and does not get beyond the rectum.

Enemata of olive oil and of ox gall have been

recommended in cases of long-standing fæcal retention for their softening effect on the fæces. Large quantities of olive oil—8 to 16 ounces—have been introduced into the large intestine at one time, and retained there with excellent results. We have used smaller quantities than these—4 to 6 ounces—with great advantage in the constipation that often follows typhoid fever, and in other cases of chronic constipation. The temperature of the oil should be raised to about 100° F. If the patient is on his back the pelvis must be raised a little by placing a hard cushion under it, and the oil allowed to flow from an irrigator into the bowel very slowly through a long colon tube introduced for about 10 inches. From fifteen to twenty minutes should be allowed for this process. In the first instance the enema should be administered at bedtime, so that, if possible, it may be retained all night and lead to an easy action in the morning. Gradually the frequency of the enemata may be decreased, until finally with restoration of regular unaided action they are abandoned altogether. If, however, the oil will only remain a few hours in the bowel, the enema will be more conveniently administered in the early morning, and the patient should remain in bed on his back, but turning from time to time on his right side and then on his left. In case of no result from the oil enema, evacuation may be promoted by a small injection of water.

The use of a small injection of glycerine for the relief of a loaded rectum has marked an advance in the treatment of some forms of constipation.

When the fæcal accumulation is in the rectum a patient can now make certain of an action of the bowels in a few minutes, instead of having to wait the number of hours it may take for an aperient pill or draught to produce its effect. The glycerine seems to cause a free secretion of fluid from the rectal mucous membrane, and so promotes the discharge of indurated fæces.

It is, however, chiefly to the relief of an accumula-

tion in the rectum that this applies; and, therefore, it is valuable in cases where the rectum is subjected to mechanical pressure, as in pregnancy and other pelvic tumours, and also in those persons who experience a difficulty in defæcation owing to the dryness and hardness of the fæcal mass. Nevertheless, it is of only auxiliary service in the treatment of most cases of chronic constipation. A teaspoonful or two of glycerine may be injected by means of one of the small syringes supplied for this purpose, or suppositories containing glycerine may be employed; these latter have been found convenient of application in children. Pure glycerine is not suitable for prolonged use, either as an enema or a suppository, as it is liable, if abused, to excite a very troublesome and persistent mucous discharge from the rectum. In some instances we have found a tablespoonful of glycerine mixed with 2 or 3 ounces of water answer better than pure glycerine.

A small cone of soap, introduced just within the anus, will usually serve to stimulate defæcation in an infant.

When the constipation is associated with what is called "**biliousness,**" and the tongue is thickly coated, the complexion sallow, the conjunctivæ bile-tinted, the stools pale and offensive as well as scanty, and the urine high-coloured, or when troublesome hæmorrhoids are present, it is necessary to promote the outflow of bile by the use of cholagogue remedies, and in the latter case by causing a free outflow of fluid from the intestinal vessels we relieve venous congestion and thereby remove hæmorrhoidal distension. We should in such cases prescribe a grain of calomel or 2 grains of blue pill, or $\frac{1}{6}$ grain of resin of podophyllum, with 5 grains of compound rhubarb pill, or with 5 grains of colocynth and henbane pill, at bedtime, and a teaspoonful or two of Carlsbad salts in a tumblerful of hot water the following morning. Podophyllin proves a very irritating and unpleasant purge to some persons, but

others are able to take regularly a teaspoonful of a tincture made by dissolving a grain of podophyllin in an ounce of compound tincture of cardamoms, without any unpleasant effects, and we have seen it prove very efficacious in the relief of hæmorrhoids, no doubt by the amount of fluid it causes to be discharged from the intestinal surface.

For the relief of habitual constipation the milder vegetable should be preferred to the saline purgatives, of which increasing doses are inevitably required. Mercurial preparations should never be employed for regular use.

There are a number of medicinal expedients for relieving the milder forms of habitual constipation; few are better than the more or less regular use of a **dinner pill** such as the following:—

℞ Aloes extracti ... ... gr. jss.
Ipecacuanhæ pulveris ... ... } āā gr. ss.
Nucis vomicæ extracti ... ... }
Quininæ sulphatis ... ... gr. j.
Saponis ... ... gr. ss.
Misce, fiat pilula. To be taken immediately before dinner.

A tumblerful of cold water, or, if preferred, of an effervescing slightly alkaline water, such as Apollinaris, may be at the same time taken night and morning.

It is necessary to enumerate a number of useful aperient medicines which have proved of value in the treatment of chronic constipation: compound liquorice powder; confection of senna; an infusion of 6 to 10 senna pods, allowed to soak all night in half a tumbler of water (for children it may be made more palatable by the addition of some syrup of stewed prunes); sulphur in the form of confection or lozenges, or tabloids; cascara sagrada, now very largely used in a variety of forms; phenol-phthalein, or purgen; agar-agar and regulin: all these are useful in appropriate cases, and enable us also to change the aperient from time to time, which will be found advisable.

Of all these perhaps cascara is at present the most popular: it is presented to the public in every possible form—syrups, extracts, tinctures, capsules, lozenges, tabloids, etc. Its prolonged use, two months or more at a time, has been especially advocated for the relief of habitual constipation. It is, however, somewhat difficult to estimate accurately the dose that is best suited to individual cases, and it is highly desirable to use the smallest dose that is consistent with efficacy; 20 or 30 minims of the fluid extract may be given at bedtime, and its effects noted, and the subsequent doses regulated accordingly. An aromatic syrup has been introduced into the B.P., and this may be given in doses of from ½ to 2 teaspoonfuls. If taken in large purgative doses it is usually followed by constipation, and the point in its administration is to give just the quantity needful to procure one soft evacuation daily, and no more. Some find it best to give a small dose—5 to 10 minims of the fluid extract—three times a day directly after meals, rather than a single dose at night; attempts should be made to diminish the dose, and finally, if possible, to do without the drug entirely.

We have found the sugar-coated tabloids of Burroughs & Wellcome a most convenient and efficacious form. These are made of three strengths, containing 1, 2, or 3 grains of the solid extract.

Small doses of castor oil, a dram night and morning, with or without belladonna, though unpleasant to take, are often effectual in relieving chronic constipation.

Liquid paraffin has been used with a view of lubricating the fæces. The pharmacopœial form is as good as any, though many proprietary preparations have been introduced. One of the best of these is chrismol; it is prepared in various forms—a tasteless liquid, or flavoured with lemon or peppermint, or in capsules (30 minims each), or as a confection for children (one or two teaspoonfuls night and morning). Paraffin by no means always functions

as an evacuant. Some patients complain that its oily character seems to prevent the rectal muscle gripping the motion and ejecting it. Given simultaneously with bismuth, a sticky adhesive paint results, which checks the movement of fæces along the bowel. Agar-agar, a Japanese seaweed, has been used for the relief of habitual constipation. It has the property of freely absorbing water, and itself resists digestion. It may be given as a powder—a teaspoonful or more—mixed with food, two or three times a day, or may be taken apart from food, in the form of tasteless shreds, of which regulin is the usual preparation. It should not be given to patients in whom digestion is readily disturbed.

Some patients prefer taking their aperient in the morning, fasting, in the shape of one of the **natural purgative waters**, such as Apenta, Friedrichshall, Püllna, Birmenstorf, or Rubinat; these contain the aperient and bitter magnesium sulphate, and hence, in Germany, they are called "bitter waters." A few ounces, 3 to 6, of any of these waters taken fasting act rapidly with most persons and produce one or two loose motions. Carlsbad salts, composed chiefly of sodium sulphate, act more comfortably with some patients than the bitter waters. The dose is 1 to 3 teaspoonfuls dissolved in a tumblerful of hot water.

In place of these waters we can prescribe a morning draught, containing 1 dram or more of magnesium sulphate, 1 dram of sodium sulphate, 2 drams of syrup of ginger, and $1\frac{1}{2}$ ounces of cinnamon water. Sodium phosphate is preferred by many, as it is mild in its action, and almost tasteless; it is very suitable for children.

In cases in which habitual constipation is associated with a tendency to corpulency and loaded abdominal veins, what the Germans call "abdominal plethora," excellent results are obtained from a course of waters at Carlsbad, Marienbad, Tarasp, Brides-les-Bains, or, at home, at Harrogate, Leamington, or Llandrindod Wells.

In more purely dyspeptic cases, and where there is much want of tone in the whole alimentary canal, the gaseous sodium chloride waters of Kissingen and Homburg answer exceedingly well.

In such cases a course of ordinary hydrotherapy in a well-conducted hydropathic establishment is also often of great value.

Belladonna, ever since Trousseau warmly advocated its use in chronic constipation, has been largely employed in its treatment. It is believed by some to act by relieving intestinal spasm. It may be given combined with nux vomica or associated with aloes, ipecacuanha, or other aperients. It is best at first to try its effect alone, or in combination with nux vomica; from $\frac{1}{6}$ to $\frac{1}{4}$ grain of extract of belladonna with $\frac{1}{4}$ grain or $\frac{1}{2}$ grain of extract of nux vomica may be given in a pill every night at bedtime. If this fails it may be combined with aloes, or ipecacuanha, or both.

The following formula has been found a good one (the precise amount of each ingredient may, of course, be suitably modified):—

℞ Aloinæ ... ... gr. $\frac{1}{4}$.
Strychninæ sulphatis ... ... gr. $\frac{1}{48}$.
Extracti belladonnæ viridis ... ... gr. $\frac{1}{2}$.
Pulveris ipecacuanhæ .. .. gr. $\frac{1}{3}$.

Misce et fiat pilula. To be taken daily.

Employed alone, belladonna seems to be more efficacious in women than in men, and appears especially applicable to those cases where a painful condition of some of the pelvic viscera (uterus or ovaries) tends to constipation by inhibition of intestinal peristalsis.

Opium in very small doses has been said to act as an aperient in similar cases.

Cases of chronic constipation associated with general debility and anæmia, and dependent on want of muscular tone in the intestinal walls, require tonic as well as aperient treatment. In such cases nux

vomica or strychnine with quinine and iron is especially useful. In the constipation of chlorosis the following prescription will be found valuable:—

℞ Ferri et quininæ citratis ... ... gr. lxxx.
Liquoris strychninæ ... ... ♏ xl.
Syrupi simplicis ... ... ℥j.
Aquæ ... ... ad ℥viij.

Misce, fiat mistura. Two tablespoonfuls to be taken twice a day, an hour before food; and

℞ Aloes extracti ... ... gr. ij.
Belladonnæ extracti ... ... gr. ½.

Misce, fiat pilula. To be taken every night.

Or the following, which is very efficacious but not so agreeable to take:—

℞ Ferri sulphatis ... ... gr. xvj.
Magnesii sulphatis ... . ℥j.
Quininæ sulphatis ... . gr. xij.
Liquoris strychninæ ... ... ♏xl.
Acidi sulphurici diluti ... ... ♏xl.
Aquæ ... ... ad ℥viij.

Misce, fiat mistura. Two tablespoonfuls twice a day, an hour before breakfast and dinner.

This mixture will often succeed in overcoming constipation in anæmic women after most other aperients have failed, and it also acts as a blood tonic.

In certain cases in which it has appeared undesirable to give medicines by the stomach, hypodermic injections of a sterilised 2 per cent. solution of *magnesium sulphate* have been employed successfully to overcome constipation. From 3 drams to an ounce of this solution is injected subcutaneously with the usual antiseptic precautions.

Lane has described cases of chronic constipation due to insufficient emptying of the large bowel, often associated with adhesions about the cæcum or downward displacement of the transverse colon: he has dealt with these by making an anastomosis between the lower part of the ileum and the sigmoid flexure. He claims that the operation has given good results, and

has not led, as might have been expected, to chronic diarrhœa. The fact that the short-circuited portion of bowel is apt at times to become a stagnant cesspool has induced him also to resect the whole intervening portion of the bowel. From a study of the recorded cases we are unable to recommend the procedure until less drastic measures have completely failed to afford relief.

Appendicostomy has been employed in some cases of inveterate constipation, and the colon is irrigated by means of a catheter passed into the appendicular opening. Greater care in the administration of enemata per anum, inasmuch as the lodgment of fæces is apt to take place chiefly at the side of the sigmoid flexure, should go far to render this operation unnecessary.

ADDITIONAL FORMULÆ

Cascara mixture for habitual constipation

℞ Extracti cascaræ sagradæ liquidi, ʒij.
Tincturæ nucis vomicæ, ʒiij.
Tincturæ belladonnæ, ʒiij.
Glycerini ad ʒiv.
M. f. mist. A teaspoonful night and morning for four days, then only at night.
(*Whitla.*)

Another

℞ Extracti cascaræ liquidi, ʒv.
Tincturæ nucis vomicæ, ʒss.
Aquæ laurocerasi, ʒss.
Syrupi simplicis, ʒss.
Aquæ ad ʒv.
M. f. mist. Three or four teaspoonfuls in the day.
(*Dujardin-Beaumetz.*)

For constipation in very young infants

℞ Mannæ, ʒijss.
Aquæ calidæ, ʒjss.
M. f. mist. A dessertspoonful every hour until it acts.
(*Monti.*)

For infants with rickets and intestinal atrophy

℞ Olei morrhuæ, ʒijss.
Syrupi simplicis, ʒijss.
Mucilaginis acaciæ, ad ʒiij.
M. f. mist. A dessertspoonful three times a day. (*Monti.*)

Aloes and iron pills for obstinate constipation

℞ Extracti aloes aquosi, gr. j.
Ferri sulphatis, gr. ij.
M. f. pil. One to be taken three times a day after each meal for a week, then one twice a day for a fortnight, then one every night. (*Spender.*)

Dinner pills

℞ Extracti aloes socotrinæ, gr. ss.
Extracti nucis vomicæ, gr. ss.
Pulveris ipecacuanhæ, gr. ss.
Pulveris capsici, gr. j.
M. f. pil. To be taken daily after dinner. (*Whitla.*)

Dr. Baillie's dinner pills

℞ Extracti aloes socotrinæ, gr. xv.
Pulveris ipecacuanhæ, gr. vj.
Pulveris zingiberis, gr. xxiv.
Syrupi, q.s.

M. et divide in pil. xij. A pill to be taken before dinner.

Pills for constipation

℞ Aloinæ
Extracti nucis vomicæ
Ferri sulphatis
Pulveris myrrhæ
Saponis
āā gr. ss.

M. f. pil.

If fæces are dry, add—
Ipecacuanhæ pulveris, gr. ss.

If the pill gripes, add—
Extracti belladonnæ, gr. ss.

One, or just as much of one as suffices to procure a natural action next morning, to be taken half an hour before the last meal of the day. As an alternative, 5 to 20 drops of fluid extract of cascara sagrada in an ounce of water may be taken at bedtime, or before dinner; or both failing to agree, 2 or 3 grains each of dried carbonate of soda and powdered rhubarb may be taken before the mid-day meal. (*Clark.*)

Dr. Gregory's pill for constipation

℞ Extracti aloes aquosi
Saponis
Pulveris rhei
Pulveris ipecacuanhæ
āā gr. xl

M. et divide in pil. xij. One or two for a dose.

Aperient lemonade

℞ Acidi citrici, ʒv.
Magnesii carbonatis, ʒiij.
Syrupi simplicis, ℥ij.
Tincturæ limonis, ♏xx.
Aquæ ad ℥x.
M. (*Mathieu.*)

Iridin and aloes pills for constipation of the gouty

℞ Iridini, gr. xxiv.
Aloes pulveris, gr. xviij.
Extracti hyoscyami, gr. vj.

M. et divide in pil. xij. One at bedtime, to be followed by a glass of Carlsbad water the following morning.

Cholagogue purgative pills

℞ Hydrargyri subchloridi, gr. ½.
Podophylli resinæ, gr. ½.
Pulveris ipecacuanhæ, gr. ½.
Pilulæ colocynthidis et hyoscyami, gr. iij.

M. f. pil. To be taken at bedtime. (*Bruce.*)

Aperient and stomachic

℞ Sodii bicarbonatis, gr. xv.
Spiritus ammoniæ aromatici, ♏x.
Tincturæ sennæ compositæ, ♏xv-xxx.
Infusi gentianæ compositi, ad ℥j.

M. f. haustus. To be taken three times a day, five minutes before meals. (*Bruce.*)

Another

℞ Pulveris rhei, gr. x.
Sodii bicarbonatis, gr. xv.
Tincturæ zingiberis, ♏x.
Spiritus ammoniæ aromatici, ♏xv.
Aquæ menthæ piperitæ ad ℥j.

M. f. haustus. To be taken half an hour before food twice daily.

Another

℞ Infusi rhei, ℥ss.
Tincturæ gentianæ compositæ, ʒss.
Sodii bicarbonatis, gr. x.
Spiritus chloroformi, ♏x.
Aquæ menthæ piperitæ ad ℥j.

M. f. haustus. To be taken twice or thrice daily, half an hour before food.

Pills for habitual constipation

℞ Quininæ sulphatis, gr. xv.
Extracti aloes aquosi, gr. xxx.
Pulveris glycyrrhizæ, q.s.

Ut f. pil. lx. Take three pills night and morning.

Or

℞ Podophylli resinæ, gr. iv.
Extracti belladonnæ, gr. ij.
Extracti gentianæ, q.s.
Pulveris menyanthis, q.s.

Ut f. pil. xxv. One to three pills in the morning.

Or
(in more obstinate cases)

℞ Pulveris rhei } āā
Extracti aloes aquosi } ʒss.
Extracti colocynthidis, gr. iij.
Mellis, q.s.

Ut f. pil. xx. Two to four daily. (*Bamberger.*)

Podophyllin pills for chronic constipation

℞ Podophylli resinæ, gr. j.
Extracti aloes aquosi, gr. x.
Extracti rhei, gr. x.
Extracti taraxaci, gr. xv.

M. et divide in pil. x. One, two, or three at bedtime. (*Nothnagel.*)

CHAPTER X

TREATMENT OF DISEASES OF THE INTESTINES: DIARRHŒA, INTESTINAL CATARRH, ACUTE AND CHRONIC

Diarrhœa a Disease as well as a Symptom—An Inflammatory and a Non-inflammatory Form—Causes of Acute and Chronic Diarrhœa—Local Irritation from Offending Ingesta—Influence of Cold—Secondary to Organic or Constitutional Disease—Endemic or Epidemic in Hot Weather, and Microbic and Specific—Sometimes Eliminative of Toxic Substances in the Blood—Infancy a Predisponent to Intestinal Catarrh—Other Symptoms of Acute Intestinal Catarrh—*Treatment*—Diet—Milk — Farinaceous Foods — Egg Albumin — Acidulated Lemonade—*Medicinal Treatment*—Eliminative—Enemata—Castor Oil—Rhubarb—Use of Alkalis—Opium—Formulæ for Infants—Astringents—Salts of Bismuth—Chalk—Tannin—Coto Bark — Intestinal Antiseptics — Calomel — Salol — Resorcin, etc. — β-Naphthol—Ichthalbin—Lactic Acid.

Acute Septic Diarrhœa of Infants: *Treatment*—Intestinal Irrigation.

Chronic Diarrhœa: Food for Chronic Cases — Vaccine-therapy—Quinine in Malarial Cases—Milk and Vichy Water—Peptones — Mineral Astringents — Kissingen Water — Intestinal Irrigations—Plombières Treatment.

Additional Formulæ.

It has been said that **diarrhœa** is a symptom and not a disease, and that the disease of which it is a symptom is *inflammation of the intestinal mucous membrane*, or *intestinal catarrh*. From the point of view of treatment this question is not, perhaps, of much importance, and we may regard diarrhœa both as a symptom and as a disease. Certainly there are forms of diarrhœa which are not inflammatory, and cannot be rightly regarded as dependent on inflammation of the intestinal mucous membrane, and in which the symptom is of almost sole importance, and it may, therefore, be justly considered as a functional disease.

In this chapter we shall regard diarrhœa as often

dependent on acute and chronic intestinal catarrh, especially when the catarrhal condition is general, and affects a large extent of mucous membrane; but as occurring also in other states which are chiefly characterised by a morbid flux from the bowels.

We consider, then, that there is justification for the division of diarrhœa into inflammatory and non-inflammatory: the latter including those cases of emotional origin, or nervous diarrhœa, analogous to the polyuria of an hysterical attack, and those of mere exaggeration of physiological function, habitual in some persons, and in many instances dependent on any slight excess in the quantity or error in the quality of the ingesta. In these cases, too, the matters discharged are ordinary fæcal matters simply, in an unduly liquid state. In cases of diarrhœa dependent on inflammatory catarrh of the intestine the flux from the bowel consists in part of inflammatory exudation from the catarrhal mucous membrane, in part of intestinal secretions hurried onwards by the exaggerated peristalsis attendant on the inflammation, and in part of unabsorbed food, partially or wholly undigested. In chronic diarrhœa, due to chronic intestinal catarrh, abundant muco-purulent secretion may be present in the discharges.

With these few preliminary remarks we may pass on to the consideration of the **causes** of acute and chronic diarrhœa.

We must bear in mind that the intestinal mucous membrane is particularly liable to catarrhal inflammation, and that comparatively slight irritation is sufficient to excite it, especially in certain individuals in whom the intestinal mucous membrane is peculiarly sensitive.

1. The most common cause of intestinal hyperæmia, catarrh, and diarrhœa is **local irritation**, and the most usual local irritant is offending ingesta. A variety of food substances will, under certain conditions, excite diarrhœa, either substances unsuitable in quality, i.e. in themselves indigestible, and acting

as irritating foreign bodies, or substances in a state of commencing decomposition, and capable of acting as chemical irritants, or simply food too copious in quantity, or badly prepared. The pouring out of an excess of bile, or bile of an abnormal quality, may act in the same way ; on the other hand, an absence of bile, from inflammatory closure of the common duct, may also lead to diarrhœa, for in the absence of the alkaline bile, which usually neutralises the acidity of the chyme as it passes out of the stomach, the contents of the small intestine remain acid, and therefore act as an irritant, and set up an intestinal catarrh from the lack of bile. The loose motions are in such cases found to be white, or clay-coloured, and often very offensive, as a due admixture with bile also prevents the formation of irritating products of putrefaction by its known antiseptic action.

Long-retained indurated fæces (intestinal concretions) may set up catarrhal inflammation of the intestine, not only by mechanical irritation, but also by the toxic substances developed by the putrefactive changes they undergo.

2. **Chill** to the surface is a common cause of intestinal catarrh. The catarrh so caused is probably dependent on a reflex vaso-motor influence arising through the cutaneous nerves.

3. The intestinal catarrh may be **secondary,** and due to a morbid state of the intestinal mucous membrane, which may itself be caused by some other organic or constitutional disease—e.g. obstruction to the circulation through the liver or in the portal vein causing venous hyperæmia of the intestine, or a more general and more permanent venous congestion dependent on chronic pulmonary and cardiac disease. It will be readily understood how easily a diarrhœa may be excited in these morbid hyperæmic conditions of the intestinal mucous membrane by any slight irritation. Such hyperæmic states may, however, exist without diarrhœa. With lardaceous degeneration, tuberculous, cancerous, dysenteric, or typhoid ulcera-

tion of the mucous membrane, we are not directly concerned now, as they will be dealt with in other chapters, but they also are well-known causes of diarrhœa.

4. Many instances of **endemic** or **epidemic** diarrhœa, such as are especially prone to occur in hot weather, are infective and of **microbic** origin; and the elevation of temperature, which has been regarded as a cause of diarrhœa, may only act by calling the infective organisms into activity, or by promoting the activity of putrefactive processes in foods and beverages. Such epidemics are promoted among the children of the poor by the use of infected milk, and the passage from child to child of dirty teats and "comforters." Under this heading we should group those cases which occur after drinking water from suspected sources, and probably contaminated with sewage matters, and those associated with malarial infection. The agency of the house-fly in the contamination of food must not be overlooked. Martin* has drawn attention to the relation between fly prevalence and infantile diarrhœa. The so-called Morgan's bacillus seems to be the causal organism in a large proportion of cases.

5. Some attacks of diarrhœa are **eliminative,** and are excited by the presence of toxic substances in the blood, as in uræmia, etc.

6. Infancy seems to be a predisposing cause of intestinal catarrh, which is very common in nursing children. This is due not only to the extreme sensitiveness of their intestinal mucous membrane, but also to the frequent absence of that extreme care and cleanliness which are needed in the selection, preparation and *storage* of their food in order to avoid exciting gastro-intestinal irritation. The too early recourse to farinaceous foods is responsible for much of the gastro-intestinal disorders of infancy.

Diarrhœa is often the only **symptom** of acute intestinal catarrh, but at other times attacks of pain

* Horace Dobell Lecture, Royal Coll. of Phys., London, 1912.

and colic precede, and are relieved by, evacuations from the bowels. Some flatulent distension of the abdomen and tenderness on pressure are also common. Fever is present in some cases, especially in those caused by chill and those due to the action of a specific contagion. Thirst is generally complained of in acute diarrhœa, owing to the considerable loss of water from the blood.

One of the chief points in the **treatment** of diarrhœa, whether **acute** or chronic, is a suitable regulation of the diet, and when the diarrhœa has been caused by faulty feeding, this, together with rest in bed, will often alone effect a cure. There is one general rule which applies to all cases of diarrhœa, and that is the avoidance of all foods which leave much indigestible residue, and that may therefore tend to maintain irritation of the intestinal mucous membrane Only such foods should be prescribed as leave an unirritating residue as a result of their digestion, and have no tendency to undergo decomposition into irritating acid substances in the intestine.

It is scarcely necessary to point out that all vegetables, fruits, nuts, brown bread, all fat, rich, or acid dishes, all forms of animal food that are hard or tough, and therefore difficult of digestion, should be avoided.

In cases in which milk is readily and easily digested it is one of the best foods. It should be first boiled or sterilised, and given diluted with water, or lime water, or soda water. In cases in which milk is not easily digested, and when we find the curd of milk passed in the motions, we must prescribe unirritating farinaceous foods—arrowroot, sago, tapioca, or ground rice, prepared with water and flavoured with some aromatic spices, such as cloves, cinnamon, or nutmeg.

Egg albumin has been found an excellent food for children with diarrhœa when milk disagrees. The white of one or two eggs should be whipped up with 4 to 8 ounces of water, a little salt added, and a few drops of brandy. This may be given freely. Whey

whey and cream, chicken or veal broth with the whipped yolk of an egg, and water-arrowroot, may all be employed as temporary substitutes for milk in the feeding of infants and young children.

Many cases of acute diarrhœa may be quickly cured by limiting the food, for a day or two, to water-arrowroot, flavoured with a little port wine or cognac. Clear soup or consommé, when this is preferred (or as a variety), may be given, thickened with arrowroot, sago, or tapioca.

The best beverage is soda water and milk, with a small quantity of brandy, iced if there is much thirst and fever.

For the troublesome thirst that commonly accompanies diarrhœa, the patient may be allowed to sip lemon juice and water acidulated with dilute sulphuric acid.

On the subsidence of the acute attack a gradual return to ordinary diet may be permitted. For a few days, however, we should restrict the patient to clear soup, or mutton or veal broth, thickened with a little crumb of stale bread, tapioca, or sago. Boiled chicken, pheasant, or partridge, with rice, may be permitted, or some boiled or grilled whiting or sole and a little mashed potato. A little weak brandy and water or port wine and water may be allowed as a beverage.

With children also the return to full milk diet must be by gradual stages, the degree of dilution being diminished regularly, as the conditions indicate.

If the diarrhœa has been caused by chill, rest in bed will be needed, and a warm poultice or hot flannel should be applied to the belly, and as a prophylactic an abdominal belt of flannel, or flannel underclothing, should be worn. With infants it is not sufficient to clothe the body warmly: the limbs must be kept thoroughly warm as well. Great care should be taken that they are not chilled at the daily washing, and it may be necessary to forbid washing all over for a time.

The **medicinal treatment** of diarrhœa must be adapted to the circumstance under which it has occurred. When it is clearly traceable to the presence in the alimentary canal of irritating ingesta or retained excrementitious substances, we should aid this effort of nature to eliminate them. If from examination of the colon we have reason to think indurated fæces are retained there, or if small scybala are seen floating on the fluid stools, or if obstinate constipation has preceded the attack, copious enemata of warm soap and water, with or without a tablespoonful or two of castor oil, usually succeed in evacuating such accumulations as are in the large intestine. If, on the other hand, the irritating substances appear to be still in the small intestine, as is usually the case when severe colicky pains are complained of, it is advisable to give a mild but efficient cathartic; a dose of 2 or 3 grains of calomel has the advantage of being tasteless and well borne, even by an irritable stomach, and it is usually effectual; or a small dose of castor oil, and best in the form of an emulsion, may be given.

℞ Olei ricini ... ... ʒvj.
Pulveris tragacanthæ compositi ... ... ʒj.
Syrupi ... ... ʒiv.
Aquæ carui ... ... ad ʒiij.

Misce, fiat mistura. A tablespoonful every hour or two until relieved. A smaller dose must be given to very young children—one or two teaspoonfuls, according to age.

Gregory's powder (pulvis rhei compositus) is also an excellent medicine for children for these attacks, in doses of 5 to 20 grains. Rhubarb, it must be remembered, has the valuable property of acting as an astringent after its purgative effect has passed away. A dose or two of this kind, with proper attention to diet, will usually succeed in curing cases of acute diarrhœa, dependent on the presence of irritating substances in the intestine.

But many of the commonest forms of diarrhœa seem to depend on an unduly **acid** condition of the intestinal contents, possibly owing to the absence of

sufficient alkaline bile in the small intestine; at any rate, they are easily cured by alkaline medicines without the use of any direct astringents. In such cases you do not give medicine for the purpose of immediately arresting the flux from the bowels, but for the purpose of preventing its continuance. A few doses of the following mixture, limiting the food at the same time to water-arrowroot with a little brandy, will quickly cure many of the slighter forms of acute diarrhœa:—

℞ Sodii bicarbonatis ... . ℥j.
Spiritus ammoniæ aromatici ... ... ℥iij.
Tincturæ cardamomi compositæ ... ... ℥vj.
Aquæ cinnamomi ... ... ad ℥vj.

Misce, fiat mistura. Two tablespoonfuls to be taken every two or three hours until relieved.

For an infant of a year old, the following is a suitable formula for the same purpose:—

℞ Bismuthi subcarbonatis ... ... gr. xxiv.
Pulveris cretæ aromatici ... ... gr. xvj.
Pulveris tragacanthæ compositi ... ... gr. iv.
Aquæ cinnamomi ... . ad ℥j.

Misce, fiat mistura. Take a teaspoonful every six hours.

There is a distinct advantage in curing a diarrhœa by such simple means rather than by the use of strong astringents and opiates, as the latter interfere with the action of the liver, and are apt in some persons to be followed by loss of appetite, constipation, headache, and other discomforts.

But many cases of acute diarrhœa cannot be arrested by such simple means, and we are obliged to have recourse to remedies which exercise a more direct influence over the catarrhal mucous membrane.

There are many such at our disposal, but there is none so immediately and strikingly successful as **opium.** This drug has a most remarkable influence over the circulation in mucous membranes in most persons. It has also the property of relieving pain and spasm, and when these accompany an acute attack

of diarrhœa it will rarely be wise to withhold a dose or two of this drug.

A small pill of ½ grain of extract of opium or a few drops of nepenthe may be given to adults with each of the first two or three doses of the mixture we have just prescribed, when something more efficient is needed to relieve suffering and arrest the catarrhal flux. Young children do not tolerate opium well, except in very small doses, and yet they, perhaps more than adults, need this drug to allay the hypersensitiveness of the inflamed mucous membrane.

If there seems any good reason why opium should not be given internally, it may be applied in the form of the linimentum opii externally, on hot flannels, or on cotton-wool, or sprinkled on a linseed-meal poultice. Such warm opiate applications are most useful in relieving pain.

There are several preparations in the Pharmacopœia which enable us to give opium in sufficiently small doses even to very young children. One of the best of these is the pulvis kino compositus. One grain of this powder contains only $\frac{1}{20}$ grain of opium, and this dose may be given to a child of the age of three months. Great care must, of course, be observed in repeating the dose, and it should not be left to a nurse, but to a medical man, to determine this. The following is a useful formula :—

℞ Pulveris kino compositi ... ... gr. iv.
Pulveris cretæ aromatici ... ... gr. xvj.
Sodii bicarbonatis ... ... gr. viij.

Misce et divide in pulveres quatuor. A powder to be given in a teaspoonful of water-arrowroot every three or four hours until relieved. In very young infants, under three months, a half of one of these powders, equal to $\frac{1}{40}$ grain of opium, may be given.

A safe and useful plan of giving small doses of opium, in order to arrest infantile diarrhœa and to relieve the pain and restlessness attending it, is by means of small enemata. A tablespoonful of the

following mixture should be shaken up with an ounce of thin warm starch and injected into the bowel :—

℞ Pulveris ipecacuanhæ compositi ... ... gr. iv.
(Dover's powder)
Acidi tannici ... ... gr. xij.
Mucilaginis acaciæ ... ... ʒij.
Misce, fiat enema. A tablespoonful for each injection.

As there is $\frac{1}{10}$ grain of opium in each grain of Dover's powder, and as given in this way the opium is very slowly and gradually absorbed, it forms a perfectly safe method of administering opium to young children ; but unless the diarrhœa is at once arrested much of the enema will be discharged with the next loose motion, and it may, therefore, require to be soon repeated. A larger dose—2 to 3 grains of Dover's powder—may be given to older children (five years and upwards) in this way.

Some writers object to giving opium to young children, in any dose, for this purpose ; but physicians of ripe experience who have seen the wonderfully calming and curative effect of quite minute doses of opium in such cases will not hesitate to avail themselves of this valuable resource. In the acute choleraic diarrhœa of children, Osler recommends morphine hypodermically. He says, "This drug alone commands the situation. A child of one year may be given $\frac{1}{100}$ to $\frac{1}{80}$ grain, to be repeated in an hour, and again if not better."*

In adults, if there is much gastric irritability as well as intestinal pain and spasm, relief may be almost immediately obtained by a hypodermic injection of $\frac{1}{6}$ to $\frac{1}{4}$ grain of the sulphate or hydrochlorate of morphine.

In protracted, or recurrent forms of diarrhœa, and in the later stages of acute diarrhœa, it may be needful to have recourse to the **direct astringents**, of which there are many, or to one or other of these in combination with opium.

The preparations of **bismuth** enjoy, and justly, a great reputation in the treatment of intestinal

* "Principles and Practice of Medicine" (4th edit.), p. 518.

catarrh; the oxy-carbonate, the oxy-nitrate, and the oxy-chloride (preferred by many) are all efficacious, and the salicylate is also largely used on account of its antiseptic properties; but it is probable that all these preparations of bismuth act to some extent as antiseptics. The salicylate should be chosen in the case of infectious or putrid diarrhœa, or when the evacuations are very offensive.

These preparations of bismuth are tasteless, and can therefore be easily given to children. They probably act to some extent locally, by affording a protective covering to the inflamed mucous membrane. They further absorb sulphuretted hydrogen, which may be a part of their curative action, and are eliminated in the form of black sulphides. The oxy-nitrate not only acts as an inert powder and as an absorbent of gases, but it has also marked antacid properties. It is a very basic salt, and is thus enabled to neutralise the excessive acidity of the intestinal contents. It is often advantageous to mix bismuth with prepared chalk, which also has both antacid and absorbent properties. The following formula for bismuth and chalk in powders is suitable for children:—

℞ Bismuthi subnitratis ... ... ʒss.
Cretæ preparatæ ... ... gr. xviij.
Sodii bicarbonatis ... ... gr. xij.
Pulveris tragacanthæ compositi ... ... gr. xx.

Misce et divide in pulveres sex. A powder in a dessert-spoonful of thin arrowroot every three or four hours. Half this dose may be given to infants and very young children, and twice the dose to older ones.

For adults the following mixture may be prescribed:—

℞ Bismuthi carbonatis ... ... gr. lxxx.
Pulveris cretæ aromatici ... ... gr. clx.
Sodii bicarbonatis ... ... gr. xl.
Spiritus ammoniæ aromatici ... ... ʒiv.
Mucilaginis tragacanthæ ... ... } āā ʒij.
Aquæ chloroformi ... ... }
Aquæ cinnamomi ... ... ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls every two or three hours.

In many cases larger doses of bismuth than this should be given. It is now frequently given in doses of 20 to 60 grains three times a day.

The addition to this mixture of 20 minims of liquor opii sedativus makes a valuable combination for the relief of intestinal pain and irritation as well as of diarrhœa.

Tannin and the various vegetable astringents containing it, such as catechu, rhatany, kino, hæmatoxylum, are valuable remedies in the treatment of acute and chronic diarrhœa. They are generally used in combination with antacids, bismuth, opium, etc.

Tannin is most useful for administration in enemata, and, as we have already said, a small enema of 1 to 3 ounces of warm thin starch containing 5 to 20 grains of tannin and 1 to 10 grains of Dover's powder, according to the age of the patient, is very efficacious in arresting severe forms of acute diarrhœa.

The compound powder of catechu of the B.P. is a useful form, its value depending not only on the tannin contained in the catechu, but also on the carminative substances combined with it. The dose is 10 to 40 grains.

Some preparations derived from tannin have been introduced for the treatment of diarrhœa by manufacturing chemists. The advantage claimed for them is that they pass through the stomach unchanged and exert a local action on the intestine. Tannalbin, a compound of tannin and albumin, is a tasteless insoluble powder given to adults in doses of 8 to 15 grains. Tannoform is also a powder insoluble in water, and is a compound of tannin and formic aldehyde. It has been used as an intestinal antiseptic and astringent. Tannigen is, perhaps, the most popular of these novelties; it is a compound of acetic acid and tannin, and is a tasteless insoluble powder, only dissolved (and tannin re-formed) in the alkaline intestinal secretions. The dose is 2 to 5 grains for a child, 5 to 15 grains for an adult, three or four times a day.

A useful prescription for an attack of diarrhœa which is tending to become chronic, and which appears to be maintained by a certain amount of loss of tone in the intestinal mucous membrane, is the following:—

℞ Tincturæ catechu	... ...	ʒiv.
Sodii bicarbonatis	... ...	gr. lxxx.
Spiritus ammoniæ aromatici	... ...	ʒiv.
Tincturæ nucis vomicæ	... ...	♏lxxx.
Infusi calumbæ	... ...	ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls three times a day, an hour before taking food.

In other cases a better effect will be obtained by giving doses of 10 or 15 minims of aromatic sulphuric acid in the above mixture in the place of the soda and ammonia.

We have found some troublesome forms of diarrhœa (especially those of phthisis and also some neurotic forms) more amenable to the tincture of coto bark, or its alkaloid cotoin, than to any other remedy. If the tincture is used it requires to be mixed carefully, or much of its resinous principle will be deposited and lost. A dram of the tincture should be mixed with 2 drams of spirit of chloroform and 4 drams of tincture of cinnamon, and this rubbed down with an ounce of mucilage, and then diluted with 4 ounces of caraway water. A tablespoonful of this mixture may be given to an adult every three or four hours, and 1 or 2 teaspoonfuls to a child.

Attention has for some time been directed to the use and efficiency of certain **intestinal antiseptics** in the treatment of some forms of acute diarrhœa (enteritis and entero-colitis) of microbic origin, especially in young children.*

The interesting researches of Escherich, Vignal,

* This specific epidemic form of diarrhœa, which has been variously designated choleraic diarrhœa, cholera nostras, infantile cholera, gastro-enteritis, etc., was officially named by the College of Physicians "epidemic enteritis, or zymotic enteritis."

Hayem, Brieger, A. Gautier and others have thrown much light on the action of the numerous forms of micro-organisms found in the alimentary canal. There are no microbes to be found in the intestinal canal of the new-born infant, but they begin to appear there soon after birth, entering, no doubt, by the mouth from the surrounding air. If the child is fed by other than its mother's milk (unless the milk used is sterilised), microbes may also enter the alimentary canal in its food. At any rate, an immense number of micro-organisms are found in the alimentary canal of an infant a few days old. Some of these microbes may actually take part in the physiological processes of assimilation; others may, under normal conditions, be quite inoffensive and indifferent; the substances they contribute to form, although toxic in large quantity, are in the minute quantities produced readily eliminated, and prove harmless. Amongst these are various organic acids, sulphuretted and carburetted hydrogen, ammonia, leucine, tyrosine, indol, scutol, and, above all, certain poisonous alkaloids known as **ptomaines.** But if from the prevalence of certain conditions, such as the occurrence of great heat and moisture, or the production of some abnormal change in the chemical reactions of digestion, the contents of the stomach and intestines become transformed into a medium particularly favourable to the culture and multiplication of these microbes, if they encounter putrescent substances in abundance, the toxic substances already mentioned are developed in such increased quantities that they cannot be eliminated with sufficient rapidity by the excretory organs, and toxic symptoms make their appearance, diarrhœa being the most frequent of these. This symptom seems to be excited especially by the organic acids and the alkaloids formed by microbic action. The simplest and commonest forms of diarrhœa are probably provoked by the irritant action of these *acids* on the intestinal mucous membrane, and the graver forms, notable for the suddenness, violence, and

seriousness of the attack, are probably due to the poisonous effects of animal alkaloids.

It is clear from these considerations that the rational treatment of such forms of diarrhœa must involve the adoption of means (both alimentary and medicinal) to promote intestinal antisepsis.

One of the simplest medicinal measures for the promotion of intestinal antisepsis is a purge, which carries away the undigested and fermenting products of a faulty alimentation, as well as the microbes with which they swarm. In **calomel** we have a medicine which is both purgative and antiseptic, and hence its great value and success in the treatment of infantile diarrhœa of a choleriform type when administered at the onset of the attack. The dose to be given must depend on the age of the child, but small doses frequently repeated are the best; $\frac{1}{6}$ to $\frac{1}{4}$ grain every hour for five or six doses, mixed with $\frac{1}{2}$ grain of sugar of milk, and thrown on the child's tongue, is a good way of giving it. Some physicians give from 1 to 4 grains at a dose, with the addition of a grain of Dover's powder, and some prefer grey powder, as its action is milder.

Salol has been warmly advocated as an intestinal antiseptic in these cases, and especially by Dr. Moncorvo, of Rio, in the treatment of the acute diarrhœa or enteritis of children, of malarial origin. Soon after commencing its use the diarrhœa lessens and disappears, the stools lose their fœtid odour, and the vomiting and the flatulent colicky pains cease. He considers it perfectly innocuous even to the youngest infants.

The doses he has employed have varied, according to the age of the child and the severity of the attack, from 2 to 30 grains in the twenty-four hours. It has been estimated that a child of 6 months should take $\frac{1}{2}$ grain every two hours; one of 2 years, 2 grains; and one of 5 years, 3 grains. It may be best given to children suspended in a mixture with a little mucilage and syrup.

The following formula is suitable for adults and in chronic cases:—

℞ Salol ... ...
Bismuthi salicylatis ... ...
Sodii bicarbonatis ... ... } āā ʒijss.

Misce et divide in pulveres triginta.

One to be taken before food twice or three times a day. Many other substances have been suggested as intestinal antiseptics and for the treatment of these forms of diarrhœa.

An emulsion of petroleum (33 per cent.) has been found efficacious. It is doubtless very soothing to the intestinal mucous membrane.

Resorcin has had many advocates. It may be given in doses of 1½ to 5 grains in a mixture, or in form of powder, according to the following formulæ:—

℞ Resorcini ... ... gr. xij.
Glycerini ... ... ʒiv.
Tincturæ opii ... ... ♏xvj.
Aquæ cinnamomi ... ... ad ʒiv.

Misce, fiat mistura. Dose, one tablespoonful for an adult, one or two teaspoonfuls for a child.

Or:—

℞ Resorcini ... ... gr. xij.
Bismuthi carbonatis ... ... ʒss.
Pulveris ipecacuanhæ compositi ... ... gr. vj.
(Dover's powder)

Misce et divide in pulveres sex. A powder every four hours. For children over 5 years of age.

Creasote, carbolic acid, creoline, naphthaline, menthol, thymol, sodium salicylate and benzoate, nitrate of silver, hydrochloric acid and pepsin, tincture of iodine, have all had their advocates for this purpose.

β-Naphthol and hydronaphthol, in doses of 1 to 2 grains every two to six hours, have been found very useful as intestinal antiseptics in various forms of diarrhœa: the green diarrhœa of infants, the diarrhœa of typhoid and tubercular disease, and the common forms in adults.

Ichthalbin, a combination of ichthyol and albumin, has been given by Rolly, of Heidelberg, with much benefit, in the chronic enteritis, with diarrhœa, of children. It acts as an intestinal antiseptic. He gave from 8 grains up to 45 grains three times a day.

Copious enemata of warm water mixed with 10 per cent. of alcohol or $\frac{1}{3}$ per cent. of salicylic acid or creolin water ($\frac{1}{4}$ to $\frac{1}{2}$ per cent.) are of use when we wish to exercise an antiseptic action on the large intestine.

The researches of Professor Hayem into the nature of the so-called "green diarrhœa" of infants have led to the introduction of **lactic acid** as a remedy for this and other forms of diarrhœa. The presence of a special bacillus in these cases has been demonstrated by him, and when isolated and cultivated it has been found to produce the green matter by a sort of process of excretion. Hayem observed that the vomited matters and the stools in these cases were either neutral or alkaline, and this led him to the discovery that this bacillus could not live in an acid medium. Hydrochloric acid he found a good remedy, but its action was uncertain, and he was led to try the effect of lactic acid. He gave a teaspoonful of a 2 per cent. solution to the infant a quarter of an hour after each suckling—from 5 to 8 teaspoonfuls in twenty-four hours. The vomiting, if present, soon ceased, the motions lost their green colour and became yellowish, and in a short time became normal in appearance and frequency. It was necessary to disinfect the vomited substances, the motions, and the soiled linen by treating them with a solution of corrosive sublimate. Numerous preparations are now sold for the production of *lactated* milk. Lacto-bacilline and sauerin are both suitable active preparations.

M. Hayem considers this form of diarrhœa is spread by contagion, and that the agents of infection are the germs deposited on the linen soiled by the motions. Although lactic acid given by the mouth is largely absorbed in the stomach in the form of lactates, yet

given in sufficiently large doses it can, in part, be found in the diarrhœic evacuations, and it can, therefore, exert its topical and germicide action in the intestine.

We are often called on to treat cases of acute infective diarrhœa in infants of such a fulminant type that early death from collapse is imminent. Persistent vomiting is frequently present along with an almost choleraic diarrhœa, and the temperature at first may be exceedingly high. In these cases it is futile to depend on such antiseptic measures as we have indicated. Subcutaneous injection of normal saline solution, 8 to 10 ounces, will often be given with marked benefit at the outset. If the fever is high the child may be wrapped in a rough towel wrung out in cold water.

Intestinal irrigation (enteroclysis) has also been advocated as a valuable adjunct to other treatment, but it is not often practicable. Water at 80° F. is used when the temperature is high, with the object of reducing it: 4 ounces should be injected at a time, and repeated as often as the rise of temperature indicates. If on return to bed there is much collapse, a few drops of brandy should be given and a hot bottle placed at the feet. This method also tends to cleanse the bowels of offensive accumulations and to diminish or counteract or dissipate the dangerous effects of the poisonous animal alkaloids which may have been developed. Its systematic employment remarkably ameliorates the symptoms.

All milk food should be withdrawn at once, and replaced by albumin water. If vomiting is present and is persistent, it is best to wash the stomach out at once with a weak alkaline solution (20 grains of bicarbonate of soda to a pint of warm water). Collapse must be met by frequent subcutaneous doses of $\frac{1}{2}$ drop of liquor strychninæ, and hot compresses to the abdomen. Morphia, which is of so much value in similar conditions in older children, cannot safely be given to infants. As the acute symptoms

subside we may gradually administer small feeds of white-wine whey, and later whey and cream, while the intestine may be soothed, disinfected and braced up with full doses of subnitrate of bismuth.

The **chronic** forms of diarrhœa are generally those which have resisted the treatment usually applied during the acute stage, or those which are acquired in tropical countries, or those which depend on some constitutional tendency to chronic intestinal flux, or to excessive peristalsis unduly hurrying the food through the intestinal canal.

These cases are often difficult of cure, and tax all our therapeutic resources. A searching examination should be made into the food habits of such patients, and the necessary dietetic prescriptions enforced. It is also, of course, extremely important to ascertain that the diarrhœa is not dependent on the existence of organic disease.

The dietetic **treatment** of chronic diarrhœa is of no less importance than that of the acute type, but it is difficult to carry out, owing to the impatience of most persons of the continued restraint which a suitable dietary implies.

The general principle to be borne in mind is that the food should be concentrated and small in bulk, easy of digestion in the stomach, and leaving but little residue to irritate the intestinal mucous membrane in its passage along it.

A strictly milk diet—unless in the exceptional cases in which milk does not agree—is the best. The milk should be boiled, and diluted with some alkaline water, such as Vichy or Apollinaris. Six ounces of milk with 2 ounces of Apollinaris water may be taken at first every three hours, and afterwards every two hours, if well borne. Peptonised milk or other predigested foods may be used in those cases in which ordinary milk is not well borne.

It must be remembered that an exclusive milk diet is rarely well borne, unless the patient is at the same time practically confined to bed. Indeed, rest

in bed is an important condition in the treatment of all severe and troublesome forms of diarrhœa.

Some French physicians strongly advocate the use of raw meat in the treatment of chronic diarrhœa. This may be combined with the milk diet if desired. An ounce of the lean of beef or mutton, thoroughly separated from all fat or fibrous tissue, is scraped or pounded to a pulp, and mixed with powdered sugar or currant jelly, or with a little thin tapioca or weak wine (port) and water, and taken twice or three times a day. Or, if this is objected to, some pounded underdone meat may be mixed with milk and water or a little broth or clear soup. We should begin with quite small quantities, which can be increased if the diet is well borne. If the diarrhœa ceases with this plan of feeding we should return gradually to the ordinary articles of diet, selecting, of course, those which are most easily digested, and taking care to avoid too copious a dietary.

In treating the chronic diarrhœa of infants and young children the greatest care must be given to their feeding. Minute investigation must be made into every detail as to the kind of food given, and its mode of preparation. It will constantly be found that some important physiological consideration has been overlooked or some error in the preparation of the food committed, or some form of food is being given persistently which causes irritation, and which requires to be suppressed or changed. In the case of infants the necessary modifications in the diet will be similar to those already indicated in the treatment of acute diarrhœa. With older children it will generally be found that the trouble may be set down to the account of the carbohydrate part of the food.

Chill from insufficient clothing, as we have already indicated, is also a fertile cause of the chronic diarrhœa of infancy and childhood.

Cases of malarial origin have been rapidly cured by the administration of quinine; it is necessary, therefore, not to overlook such a possible origin of the disease.

In some forms of chronic diarrhœa in hysterical women a prolonged rest-cure is the best remedy, associated with change of air and scene. If it should be due to increased and abnormal peristalsis, the bromides may prove useful.

A few cases of chronic diarrhœa, in which the stomach contents have been found to contain coliform bacteria and diplo-streptococci, have been treated with autogenous vaccines, and have seemed to benefit from the treatment, but there is not yet much evidence of the value of vaccine-therapy in the routine treatment of chronic diarrhœa.

The cases of chronic diarrhœa which originate amongst Europeans in tropical countries are best treated by dietetic measures. Dujardin-Beaumetz maintained that the only efficacious treatment consisted in restricting the patient to a diet of milk mixed with Vichy water. Dr. Feris (quoted by Dujardin-Beaumetz) found it better to treat them with solid peptones, from 3 to 6 tablespoonfuls a day, allowing at the same time 2 pints of milk daily.

In chronic diarrhœa, bismuth and the vegetable astringents already mentioned, with or without opium, will usually have been tried, and have failed to do more than procure temporary relief. In such cases, if massive doses of bismuth have failed, we sometimes find that the stronger mineral astringents will succeed better, both with adults and with children, such as oxide of zinc, acetate of lead, sulphate of copper, nitrate of silver, or pernitrate of iron, perchloride of iron, etc.

The oxide of zinc may be given in 5- to 10-grain doses in pills combined with a little chalk and opium, as follows :—

℞ Zinci oxidi ... ... gr. vij.
Cretæ preparatæ*... ... ... gr. ij.
Extracti opii ... ... gr. ½
Mucilaginis ... ... quantum sufficiat

Ut fiant pilulæ duæ. To be taken three or four times a day.

* This is added to avoid the possibility of some chloride of zinc being formed by the acid of the gastric juice.

The acetate of lead is a very effectual astringent in chronic diarrhœa, but being itself a poison it is not usually resorted to until more simple remedies have failed; it is not a remedy that should be prescribed for long periods at a time. It is best given in the form of a pill combined with opium:—

℞ Plumbi acetatis ... ... gr. ij.
Extracti opii ... ... gr. ss.
Misce, fiat pilula. To be taken three times a day.

Sulphate of copper is a still more effectual remedy for chronic diarrhœa; like the preceding, it is usual to combine it with opium. Small doses only must be given at first, on account of its irritating effect on the stomach.

℞ Cupri sulphatis ... ... gr. ij.
Pulveris cinnamomi ... ... gr. xij.
Pulveris opii ... ... gr. iij.
Mucilaginis ... ... quantum sufficiat
Ut fiant pilulæ duodecim. One pill, which may be increased to two, to be taken three times a day.

Nitrate of silver also may be given, in troublesome cases, in doses of $\frac{1}{4}$ or $\frac{1}{3}$ grain in a pill, with the same quantity of extract of opium. These astringent pills should be coated with keratin and given when the stomach is empty; they may then pass into the intestine and exercise a favourable influence on ulcerative processes there, which may possibly be keeping up the irritation and preventing a cure.

The pernitrate of iron has been found useful in forms of chronic diarrhœa associated with defective tone and general anæmia. The following mixture may be prescribed:—

℞ Liquoris ferri pernitratis ... ... ♏xx.
Liquoris strychninæ ... ... ♏iij.
Aquæ chloroformi ... ... ʒij.
Infusi calumbæ ... ... ad ℥j.
Misce, fiat haustus. To be taken three times a day.

Small doses of Kissingen water have been found useful in the treatment of some forms of chronic

diarrhœic intestinal catarrh. In small quantities, according to Leube,* it has a constipating rather than an aperient effect, and as it promotes gastric digestion, the chyme entering the intestine is in a condition more favourable for absorption.

Rectal or intestinal irrigations with tepid water have been found to have a soothing and astringent effect in some forms of chronic diarrhœa, both in children and in adults. By means of a long tube, and by placing the patient in a suitable position, the water should be made to pass as high up as possible. Some astringent salt may be added to the water, such as alum, sulphate of zinc, or acetate of lead, in the proportion of 4 or 5 grains to the pint.

We must not omit to mention the excellent results that are often obtained in cases of chronic diarrhœa (catarrhal enteritis), especially in the gouty and rheumatic, from a course of treatment at Plombières, where the ascending douche is extensively applied. Very great benefit has been derived from treatment at that spa, even in most inveterate and troublesome cases.

Many other drugs have been used by various physicians with advantage in the treatment of chronic diarrhœa; examples of most of these will be found in the appended formulæ.

ADDITIONAL FORMULÆ

For acute diarrhœa of infants, and to check putrefactive changes in intestine

℞ Hydrargyri biniodidi, gr. $\frac{1}{50}$.
Dissolve in sufficient iodide of potassium, and add chloral hydrate, 1 grain. (This dose may be given in a teaspoonful or two of dill-water.) (*Luff.*)

Creolin in the treatment of acute gastro-enteritis of infants

℞ Creolini, guttæ iij.
Syrupi althææ, ʒv.
Aquæ canellæ ad ʒiij.
M. f. mist. A teaspoonful every hour for very young infants.

* Von Ziemssen's "Practical Medicine," vol. vii., p. 390.

Powder for infantile diarrhœa

℞ Sodii bicarbonatis, gr. iv.
Pulveris rhei, gr. jss.
Pulveris cinnamomi, gr. j.
M. f. pulv. To be taken twice a day. (*Whitla.*)

For diarrhœa in infants with milk curds in stools

℞ Pulveris guaranæ, gr. xv.
Pulveris ipecacuanhæ compositi, gr. ¾.
Pulveris sacchari albi, gr. xlv.
M. et divide in pulv. x. A powder every two or three hours. (*Monti.*)
(The dose may be doubled for older children.)

For profuse diarrhœa in infants without dyspepsia

℞ Tincturæ krameriæ, ʒss.
Tincturæ opii, ♏jss.
Syrupi simplicis, ʒijss.
Aquæ destillatæ, ʒiij.
M. f. mist. A dessertspoonful every two hours. (*Monti.*)

Powders for chronic diarrhœa in infants with anæmia

℞ Ferri carbonatis, gr. jss.
Pulveris ipecacuanhæ compositi, gr. jss.
Pulveris sacchari, gr. xlv.
M. et divide in pulv. x. Three or four powders daily.
(*Monti.*)

Salicylate of iron in the fœtid diarrhœa of infants

Ferri sulphatis, gr. xx.
Sodii salicylatis, gr. xx.
Glycerini, ʒiij.
Aquæ, ʒiij.
Dissolve the sulphate of iron and the salicylate of soda separately, and then mix. A tablespoonful every hour until the stools become blackened.
(*Braithwaite.*)

A drink in infantile diarrhœa

℞ Acid. lactic, gr. xlv.
Aquæ flor aurantii, ʒj.
Aquæ ad ʒviij.
M. A tablespoonful every two hours.

For summer diarrhœa

℞ Extracti hæmatoxyli liquidi, ʒij.
Acidi sulphurici aromatici, ʒij.
Spiritus chloroformi, ʒvj.
Tincturæ opii camphoratæ [compositæ, Tincturæ cardamomi — āā ʒj.
M. A teaspoonful, in water, after each action of the bowels.
(*Eshner.*)

Arsenite of copper in chronic diarrhœa

℞ Cupri arsenitis, gr. $\frac{1}{10}$.
Aquæ, ʒv. ad ʒxv.
M. A teaspoonful every fifteen to forty-five minutes until the diarrhœa ceases.
(*Bentley.*)

Pills for chronic diarrhœa

℞ Extracti krameriæ
Extracti monesiæ
Pulveris calumbæ
Pulveris ipecacuanhæ compositi — āā ʒss.
Olei anisi, guttæ ij.
M. et divide in pil. xl. Six to ten to be taken daily.
(*Huchard.*)

Mixture for chronic diarrhœa

℞ Tincturæ catechu, Tincturæ kino — āā ʒij.
Tincturæ opii, ʒj.
Spiritus camphoræ, ʒjss.
Misturæ cretæ ad ʒiij.
M. f. mist. Two teaspoonfuls every four hours. (*Whitla.*)

For chronic diarrhœa with flatulence

℞ Tincturæ opii, ♏xv.
Extracti hæmatoxyli, gr. lxxv.
Syrupi corticis aurantii, ʒijss.
Aquæ menthæ piperitæ ad ℥v.

M. f. mist. A tablespoonful every two hours.
(*Bamberger.*)

Nitrate of silver injection in ulcerative colitis

℞ Argenti nitratis, ʒss. ad ʒj.
Aquæ destillatæ, Oj ad Oij.

Elevate the hips, and let the injection flow in slowly from a siphon-bag. (*Osler.*)

Pills for atonic diarrhœa

℞ Acidi tannici, ʒss.
Extracti opii, gr. ¾.
Extracti calumbæ, ʒss.

M. et divide in pil. xx. One every three hours.
(*Bamberger.*)

Powders for the same

℞ Zinci sulphatis, gr. xv.
Opii pulveris, gr. iij.
Sacchari albi, ʒijss.

M. et divide in pulv. xx. A powder three times a day.
(*Bamberger.*)

Antiseptic powders

℞ Benzo-naphthol, gr. ij.
Bismuthi salicylatis, gr. v.
Resorcin, gr. ij.

M. et f. pulv. One every three hours.
(*Prof. W. W. Johnston*

CHAPTER XI

TREATMENT OF DISEASES OF THE INTESTINES: PERITYPHLITIS, OR APPENDICITIS, AND DYSENTERY

Meaning and Nature of Perityphlitis. APPENDICITIS: Its Nature and Causes—Symptoms—*Treatment* of Acute Cases—Symptoms and *Treatment* of more Chronic Forms—Of Relapsing and of Suppurative Forms—Appendicular Colic—Fæcal Impaction Cases—Symptoms—*Treatment*—Caution in Use of Opium—Local Measures—Evacuants—Enemata—Salines—Calomel—Sodium Sulphate—Intestinal Antiseptics—Salol—Thymol—Prophylaxis.

DYSENTERY: Etiology—A Specific Germ—Symptoms—Varieties—*Treatment*—Opium to relieve Pain—Appropriate Food—Intestinal Antisepsis—Aperients—Ipecacuanha—Emetine Hydrochloride—Aperient Sulphates—Antiseptic Irrigation—Borax—Normal Saline—Methylene Blue—Silver Nitrate—Iodine—Thymol—Creolin—Cold Water—Astringents—Antidysenteric Sera and Vaccines—Quinine and Arsenic in Malarial Cases—Supporting Food and Tonics—Chronic Dysentery—Change of Climate—Colostomy—Prophylaxis.

SIMPLE ULCERATIVE COLITIS: Distinction from Dysentery—Symptoms—*Treatment*—Vaccine-therapy—Irrigation of Colon.

Additional Formulæ.

PERITYPHLITIS, OR APPENDICITIS

THOSE local morbid conditions occurring in the right iliac region, in the neighbourhood of the cæcum, and formerly described under the designations of typhlitis and perityphlitis, are now more commonly spoken of as cases of appendicitis, since it has been shown that the appendix vermiformis plays a predominant part in the origin of this affection. Treves, however, prefers the term "perityphlitis," and speaks of "appendicitis" as an "uncouth name." "Perityphlitis," he observes, "indicates with sufficient clearness the predominant pathological feature of an affection which may arise in more ways than one, and which has no precise clinical individuality until the peritoneum in the cæcal region

has become inflamed." Treves is commendably undogmatic in treating of this disease, and avoids and condemns the almost reckless statements made by certain other writers on this somewhat hotly-debated subject. While admitting that in the vast majority of cases the trouble begins in the appendix, he recognises a fact which others have ventured to deny, viz. that the disease sometimes takes its origin in the cæcum, although such a mode of origin is uncommon.

In discussing this point Osler argues that "the cæcum is rarely, *if ever*, filled with hardened fæces."* As we doubt this, and as it has a bearing on the appropriate treatment of such cases, we venture again to quote Treves's observations, with which, in the main, we are in agreement.

"The commonest cause," he says, "of such cases of perityphlitis as arise in the cæcum is the *stercoral ulcer*, due to the mechanical pressure and the chemical irritation of fæcal masses which have long been lodged in the cæcum. . . . In cases of considerable fæcal impaction the *greatest strain falls upon the cæcum*, and in absolute obstruction of the colon low down, the bowel, if it gives way, *will give way in the cæcal region*. . . . Inasmuch as fæcal impaction is *most common* in the cæcum, it is no matter of wonder that the stercoral ulcer should be most commón in that part of the colon. If the ulcer acquires a sufficient depth to allow the peritoneum to be infected, perityphlitis results." Treves claims, as we do, "a definite position for the stercoral ulcer in the production of perityphlitis." The remarkable thing is that it should ever have been disputed!

Perityphlitis, then, is a term with a somewhat larger meaning than the name appendicitis, as it includes cases in which the appendix may be free from disease.

By **appendicitis** we mean inflammation of the vermiform appendix, usually determined by the pre-

* "Principles and Practice of Medicine" (4th edit.), p. 530.

sence of some fæcal concretion, or foreign body, within it, which may lead by ulceration to perforation, and to the extension of the inflammation to the tissues surrounding the appendix. The bacillus coli is the organism most commonly associated with the inflammatory process.

In case of perforation a local suppurative peritonitis may be excited, limited by adhesions, and ending in the formation of an abscess which may point towards the surface. Or if perforation occur before adhesions have taken place, very serious general septic peritonitis will be aroused. Or the appendicitis may take a more chronic form, and appear as a series of relapsing attacks; and this tendency has led some to liken the appendix to an abdominal tonsil, prone, like the tonsil in some persons, to recurrent attacks of inflammation, which occasionally run on to suppuration.

Or suppurative peritonitis may arise from the passage of infective micro-organisms through the walls of the appendix into the peritoneum. Broca* maintains that in many instances the inflammation of the appendix is only a part of a general entero-colitis, which recovers and passes away in other parts of the intestine, but lingers and recurs, from structural reasons, in the appendix.

It is evident, from its anatomical situation, that the local inflammation attending an attack of appendicitis may extend to the cæcum and to the tissues around, and it has been asserted that 90 per cent. of the cases of perityphlitis are the result of disease of the vermiform appendix.

As to the causes of this affection, the tendency to it would seem, as Treves says, to "run in families." It is most commonly observed in young adults, but is found to occur also in young children and in old people. It is far more common in males than in females. It is more common in summer than in winter, and it is frequently referable to injury, as blows, strains,

* "L'Appendicite." Paris, 1900.

and violent exertion. The commonest exciting cause, according to Treves, is the lodgment of undigested matters or of fæcal masses in the colon, and hence its frequency in chronic dyspeptics and persons who eat hastily and do not properly masticate their food. He would give prominence, as Broca does, to colitis from irritating ingesta as a cause of peri-typhlitis. The entrance of foreign bodies into the appendix is not nearly so frequent a cause as was at one time supposed. Rheumatism has seemed to have a causal relation to some cases, and the symptoms have quickly disappeared on the administration of sodium salicylate.* Recently a good deal of evidence as to this hæmatogenous origin has accumulated, and appendicitis has come to be looked upon in many cases as a local manifestation of a general infection. It has been observed to occur in the course of follicular tonsillitis, typhoid, pneumonia, and some of the acute specific fevers. Pyorrhœa alveolaris has seemed at times to be the underlying cause.

The **symptoms of appendicitis** and the treatment indicated will differ according to the acuteness and form of the attack. In the most acute form, when perforation occurs suddenly, the patient is seized with a sudden severe pain in the iliac region, and this is rapidly succeeded by the signs of acute peritonitis, with a tendency to early collapse and death. The abdomen becomes distended and exquisitely tender, the legs are drawn up, the respirations are hurried and wholly thoracic, there are usually vomiting and the other symptoms of acute suppurative peritonitis. In such a case there has been a sudden rupture of an ulcerated portion of the appendix before adhesions could take place, and an escape of fæcal matter into the peritoneum, setting up a diffused suppurative peritonitis.

Some maintain that the passage of micro-organisms through the walls of the appendix without perforation is sufficient to set up such an attack.

* *See* case by the author, *Brit. Med. Journ.*, vol. i., 1894.

In the **treatment** of such a case the first point for the physician to decide is, whether he shall at once seek surgical assistance or no. In coming to a decision on this point he will have to determine whether the peritonitis is localised to the region of the appendix, or generalised over the peritoneal cavity. If the former, surgical intervention should be sought without delay. If the latter, it is wiser to avoid operation, unless the case is seen within twelve, or at most twenty-four hours from the onset. If the symptoms have lasted longer than this, it is best to wait and see if the peritonitis will not become localised, as the mortality from operation in cases of diffuse peritonitis at this stage is exceedingly high.

Great assistance may then be derived from copious administration of saline solution. This may be given either into the subcutaneous tissues or per rectum, or in cases of grave urgency directly into a vein : a pint every hour is not too much. These injections seem to dilute the toxins in the blood, and also to aid their elimination by exciting free diuresis. There is no question that they immensely improve the outlook, and also, if operation becomes necessary, put the patient in a far better way to withstand the shock.

The best posture for the patient to maintain in the presence of acute peritonitis is the semi-recumbent, in which gravity assists drainage from the more dangerous area beneath the diaphragm to the less dangerous area of Douglas's pouch.

Unless the outlook is hopeless, and the patient's sufferings are intolerable, opiates should not be given. They increase enormously the difficulty of conducting reasoned treatment, and, as we shall see in discussing acute peritonitis, bring added dangers of their own.

Sometimes perforation is not so sudden, and the patient may have complained for a few days, or even weeks, of vague pains in the right iliac region, with some symptoms of dyspepsia, flatulence, and

constipation. There may be a rigor, an evening rise of temperature, loss of appetite and thirst, then somewhat sudden symptoms of perforation may appear from rupture of an abscess which has formed round the appendix and the discharge of its contents into the peritoneum, or the same condition may arise by direct extension from the abscess. The treatment of such a case is, of course, immediate operation.

Happily in the large majority of cases the onset of appendicitis, though acute, is far less severe than this. There is at first general abdominal pain, but with its centre of greatest severity, as a rule, in the right iliac fossa. The patient's temperature and pulse-rate are raised; a tumour, very tender on palpation, may appear in the region of the appendix; and the overlying muscles are rigid and resist the hand. Such a swelling may be deep-seated, or at other times seems to be immediately beneath the abdominal wall. Such a case calls for the closest and constant watchfulness. The first essential is absolute rest in bed in charge of a skilled nurse, who must prevent all movements of the patient. Food must be entirely fluid. Hot fomentations to the abdomen do much to relieve the pain, and, if an additional anodyne is called for, they may be freely sprinkled with belladonna liniment. Purgatives should not be given; nor is there any need of enemata, unless there is some definite indication, such as a loaded rectum, a distended bowel, or a brown, dry, and thickly-furred tongue. Many physicians administer full doses of salicylate of soda, and consider that they often find directly beneficial effects. Under such treatment a rapid subsidence of the symptoms usually takes place. The tumour, however, must throughout be carefully watched, with the possibility of the occurrence of suppuration always in mind: a daily count of the leucocytes is of great assistance in coming to a decision on this point. Should an abscess form, it must be opened and drained.

But of the more common and **chronic forms of**

appendicitis we may distinguish three groups—*first* the cases of so-called relapsing appendicitis; *second* those cases which terminate in localised suppurative peritonitis, limited by adhesions, and caused usually by ulcerative perforation of the appendix; and *third*, cases in which the patient has all the symptoms of recurrent attacks, the so-called "appendicular colic." In these patients operation usually reveals a long, often twisted or constricted appendix, or only some thickening and induration at its distal end.

The symptoms attending the first of these groups consist of recurrent attacks of pain in the right iliac fossa, days and weeks, and even much longer periods, of freedom from pain intervening between the attacks; and on local examination a tumour is often to be felt deep in the right iliac region, tender on pressure. The attacks may be accompanied by sickness, flatulent distension of the abdomen, and constipation. With absolute rest in bed, opiate fomentations, and belladonna and opiate liniments applied locally, a diet restricted exclusively to fluids, such as broths, clear soups, and the like, and, if necessary, enemata of warm soap and water with olive oil, to soften and bring away all fæcal accumulations without causing any irritation or excitement of the muscular coat of the bowel—with such careful expectant treatment the great majority of these cases quiet down. But after complete subsidence of the symptoms—and this is a rule to be observed in every case of appendicitis, however slight—the patient should be kept in bed a week or more to guard against relapse. It is possible that, with further knowledge, some of these cases may come within the scope of vaccine-therapy. At present this method of treatment is only likely to be of use if some source of septic absorption, such as pyorrhœa alveolaris, is detected.

When, however, these attacks continue to recur, or become more severe at each recurrence, or when there is a distinct tumour perceptible in the region of

the appendix, or when the patient is disabled from work and anxious for relief, or if his occupation or mode of life make it likely that he may suffer from another attack when skilled treatment will not be available, an operation should be undertaken, "during a quiescent interval," for the removal of the enlarged and inflamed appendix.

In these relapsing non-suppurative cases it must be remembered that the recurrent attacks of localised adhesive peritonitis are apt to lead to constriction of the bowel, and thus to cause serious obstruction; a possible result which may be avoided by the removal of the appendix.

In the second group of cases, where there is evidence of suppuration having occurred, with a daily evening rise of temperature,* the abscess round the appendix should be freely opened by an incision directly over it, the pus evacuated, and the abscess cavity drained. A brief search may be made for the appendix, but this must not be pushed too far, owing to the risk of breaking down adhesions and opening a communication with the general peritoneal cavity. If found it should be ligatured and removed.

With regard to the treatment of those comparatively rare cases of perityphlitis from fæcal impaction in the cæcum and stercoral ulcer, which sometimes occur in young or middle-aged persons who suffer from a tendency to obstinate constipation, if we are enabled to arrive at a diagnosis to this effect, as a careful consideration of the history of the case will often enable us to do, we should be in no hurry to have recourse to operative interference.

Such attacks are preceded by constipation, intestinal discomfort, flatulence, distension, and pain especially referred to the right inguinal or lumbar

* Some have urged that rapidity of pulse is a special indication for operation; but the pulse-rate is so variable and uncertain in nervous persons, and so *very easily* raised 10 or 20 beats, that, *taken by itself*, we do not regard it as a trustworthy indication.

region. Some localised tenderness will be found over the situation of the cæcum and adjacent portions of the ascending colon, not limited to any particular spot, as is sometimes the case in *appendicitis*,* but diffused over those portions of the first part of the large intestine we have mentioned. On palpation and percussion this part of the intestine will be felt to be distended and dull; indeed, to the experienced physician there is very little difficulty in distinguishing this comparatively mild form of *perityphlitis* from the more serious appendix cases already referred to. There is often some rise of temperature, but rarely higher than 101° or 102° F., with restlessness, a furred tongue, foul breath, and a bad taste in the mouth. These febrile symptoms are not always caused by a local peritonitis, but are sometimes dependent, we believe, on superficial catarrhal ulceration of the mucous membrane and absorption of fæcal toxins.

Now, the paramount **indication for treatment** in these cases is to evacuate the fæcal matters which are retained in this portion of the intestine, and which are distending it and irritating it, and giving rise to the symptoms detailed. If such a case be treated as many authorities direct an appendix case to be treated (and some seem to include even these mild forms of perityphlitis in their general directions for treatment), and opium be freely given internally, the case will be made a protracted one, the tendency to obstruction will be intensified, the general sub-febrile condition will be aggravated instead of relieved, and the patient, who might have been comparatively well in a few days, will very likely be ill for weeks; for opium aggravates the paresis of the intestinal walls (and we have seen its administration pushed until an almost paralytic condition of the intestine has been induced),

* McBurney has pointed out that the most important diagnostic sign in connection with inflammation of the appendix is the invariable presence of a minute point of exquisite tenderness, almost exactly two inches from the anterior iliac spine, on a line drawn from this process through the umbilicus; but the invariable presence of this sign is not universally admitted.

it diminishes all the intestinal secretions, and increases the febrile state due to absorption of retained excrementitious substances.

There is, however, no possible objection to the local application of opium, and it will generally be found that the pain can be effectually relieved by the application of hot linseed poultices sprinkled with laudanum; or the mixed opium and belladonna liniments may be applied on warm lint or flannel over the seat of pain and tenderness.

In these cases, as well as in others in which the appendix is involved, but which do not call for operation, although the symptoms are persistent, the application of 5 or 6 leeches over the seat of swelling and pain has been recommended. Treves says "this measure very often has a magical effect."

To evacuate the contents of the intestine we should at first trust entirely to enemata; large enemata of warm soap and water, with which 2 or 3 ounces of olive oil have been mixed, should be slowly injected with a long tube, the patient's buttocks being raised so as to favour the retention of the enema. An enema of this kind should be administered every few hours until complete relief has been obtained.

If we find that there is no longer any local pain or tenderness, gentle manipulation of the distended bowel may serve to assist in dislodging any remaining impacted fæces; and no harm can now arise from the use of a gentle saline aperient with a small dose of calomel. A powder composed of $\frac{1}{4}$ grain of calomel with 2 or 3 grains of sugar of milk, and followed by 4 or 6 ounces of Dinneford's fluid magnesia, to which a teaspoonful or two of lemon juice should be added, is as gentle an aperient as it is possible to give, and causes no excitement of the muscular wall of the intestine. When it is clear that a somewhat stronger aperient can be given without any risk, 2-dram doses of sodium sulphate dissolved in $1\frac{1}{2}$ ounces of peppermint water may be given every four hours, until the bowels are completely relieved.

There is a wide difference of opinion between authorities as to the use of aperients in cases of appendicitis. Osler maintains that the "use of saline purges early in the disease is a most injurious practice," but then Osler is one of those who think "there is no medicinal treatment of appendicitis."* Treves, on the other hand, says, "If the onset be mild a purgative should be given at once. Over and over again an attack has been cut short by a promptly administered aperient." The explanation of this divergence of opinion lies, we think, in the fact that some writers have only the experience of hospital cases before them and know little about the great number of mild cases, associated with chronic dyspepsia and habitual constipation, that are seen in private practice. The experienced physician usually has little difficulty in distinguishing the cases in which an aperient may be given from those in which it would act injuriously.

When all tenderness has disappeared, and there is no longer any rise of temperature, a mild aperient should still be given daily for some time, until the bowel has recovered its tone. To promote the latter a tonic containing nux vomica, gentian, and ammonia will be useful. Intestinal antiseptics should be given by the mouth in these cases, if there is evidence of fæcal intoxication such as foul breath, a bad taste in the mouth, and a slight diurnal rise of temperature. Salol in 10-grain doses three times a day will answer this purpose, or a grain of thymol made into a pill with soap powder and spirit may be given instead. Such intestinal antiseptics would also, of course, favour the healing of any intestinal ulceration that may possibly exist.

The patient should, of course, be kept at rest in bed for some time, and until quite free from pain, and only fluid food, such as broths, clear soup, gruel, and occasionally a beaten-up egg, should be prescribed. A cup of tea or coffee with peptonised milk may also be allowed.

* "Principles and Practice of Medicine" (4th edit.), p. 530.

Finally, as to preventive measures in persons who have recovered from an attack. All indigestible substances should be banished from the dietary; all vegetables must be reduced to the form of soft purées, coarse brown bread must be avoided, the soft pulp only of fruits taken; milk should be freely diluted with barley water or some alkaline mineral water, so that it may not accumulate as indigestible curds in the cæcum. All solid foods must be well masticated; the meals should be small in amount, and eaten slowly. Pure water should be freely consumed, but it should not be hard water containing much lime salts. A large glass of water at bedtime and another on rising in the morning should be taken. The bowels must be made to act daily—for this purpose a dinner pill may be prescribed, or a claret glass of Apenta water drunk fasting in the morning. All violent and active exertions must be avoided. An abdominal belt should be worn.

Dysentery

Dysentery is a disease, or, as some believe, a group of diseases, characterised by symptoms referable to inflammation, usually associated with ulceration, of the mucous membrane of the large intestine.

Much difference of opinion has existed with regard to the etiology of dysentery. Formerly some regarded climatic conditions, such as great heat and moisture, as in tropical countries, or great and rapid alternations of temperature, or marsh malaria, as of themselves efficient causes of dysentery. Others have referred the occurrence of the disease to exposure to cold and wet, to over-fatigue, and to eating unripe fruits. But now the accepted view is that its essential cause is a **specific germ or germs** (varying according to the particular form of the disease), and that the disease is propagated by contagion and infection. The *Amœba coli* has been identified as the cause of a special type of dysentery, hence termed *amœbic* or *tropical dysentery;* but it cannot be regarded as

common to all forms of dysentery, for the most careful and experienced observers have failed to find it in the stools in many outbreaks, and it was not found in the form of dysentery encountered during the war in South Africa.

The disease is said to occur *sporadically* in very hot seasons in temperate climates, but this is very rare; *endemically*, it is found to occur continually in certain hot countries, such as Hindostan, Cochin China, Algiers, Egypt, etc., and although it may in some instances be found to coexist with malarial affections, such as ague and hepatitis, yet it is found also to occur in countries quite free from malaria, and to be absent from others where malarial affections are common. It would appear, therefore, to have little in common with ordinary malarial diseases.

Besides this form of so-called amœbic dysentery, there is a bacillary dysentery, which is met with in widely separated parts of the world, including the tropics, and is due to a rod-like bacillus, isolated by Shiga in Japan in 1898—the *Bacillus dysenteriæ*. It is present in the mucous discharge from the outset, and by the end of the first week in almost pure culture. Other organisms have been described, which may or may not be identical with Shiga's bacillus. Dysenteric symptoms have been induced by injection both of the bacilli and of the toxins derived from them; the chief stress of the toxæmia falls on the large intestine. Infection in bacillary dysentery takes place by the food and drink. Flies seem to be an important agency in its dissemination, and "carriers" have been the means of exciting an outbreak.

The extreme frequency and fatality of dysentery as an epidemic amongst armies in the field shows clearly that the massing together of great numbers of men under conditions of life which must necessarily, at times, be the reverse of hygienic, is most favourable to its origin and propagation. This fact is consistent with the knowledge of its propagation by a specific germ;

for in camps there often exist all the conditions most favourable to the diffusion of such a cause of disease, while every predisposing cause, such as over-fatigue, exposure to wet and cold, mental depression, unsuitable or insufficient food, and overcrowding, are at times in operation.

The disease may originate in the use of impure water for drinking, just as typhoid fever does, and then be rapidly propagated by the further contamination of the water supply by dysenteric stools. In war, foul latrines, in which the air becomes charged with fœtid organic emanations, are stated to be a common cause of dysentery,* the effluvia from dysenteric stools being especially injurious.

The reason of its constant endemic prevalence in certain tropical countries is to be accounted for by the fact that heat and moisture favour the propagation and diffusion of the specific germ, and also probably by the unhygienic habits of the natives.

The **symptoms** presented by sufferers from dysentery depend on whether the disease is acute or chronic, on the type or form of the disease, and on the extent to which the inflammation and ulceration, sloughing, or thickening of the intestine have spread.

We shall only here enumerate the more characteristic ones. In acute cases at first there are abdominal pain and diarrhœa, the motions soon becoming *dysenteric;* that is to say, they contain a mixture of yellowish-white mucus and blood. The evacuations are preceded by painful tenesmus, especially referred to the region of the anus, and often involving the bladder, and there is a constant desire to evacuate the bowels, which usually only results in the passage (with much straining) of a small quantity of mucus and blood. There is pain and tenderness along the course of the large intestine, and the mucous membrane of the rectum is hot and inflamed, and intensely sensitive. As the

* Parkes's "Hygiene."

ulcerative process advances, the motions are found to consist chiefly of glairy mucus, pure blood, and shreds of mucous membrane, which have been spoken of as "intestinal scrapings," with which hard fæcal masses are occasionally seen to be mixed. In severe epidemic cases the patients are harassed with a constant desire to go to stool and to urinate, which they do from 50 to 200 times in twenty-four hours. The pain is relieved after each stool. As the disease advances, the motions become horribly fœtid, and the mucus gives place to a reddish sanious fluid, containing fragments of membrane, and mixed with a considerable quantity of pus. Together with these local symptoms there is in some forms much thirst and fever, with dry skin, rapid emaciation, loss of strength, and exhaustion from the constant intolerable pain, tenesmus, and loss of blood.

Some authors notice particularly the absence of bile in the stools, and it has been pointed out that in severe cases all the digestive secretions are changed or entirely checked. The saliva becomes acid and loses its glycogenic properties, the gastric juice becomes alkaline and can no longer form peptones, while the secretion of bile is wholly arrested.

Sporadic cases usually run a much milder course, and the symptoms are by no means so severe. Dr. Washbourn, from his experiences in South Africa, is disposed to regard those cases that have been described as "simple colitis" and "ulcerative colitis," such as prevail in certain lunatic asylums, as sporadic cases of the same disease.

Chronic dysentery is usually a sequel of an acute attack. The patient never completely recovers. The stools remain sero-purulent, and may contain blood at intervals. Diarrhœa and constipation are apt to alternate. A dull, heavy abdominal pain replaces the tenesmus: the belly is flat and retracted, and tender on pressure. There is general disturbance of health, varying widely in degree in different cases. Some patients are greatly emaciated,

others show little defect of nutrition. Temperature may be raised during an exacerbation, but remain subnormal in the intervals.

Attention to the following **indications** will assist us in the **treatment** of cases of dysentery :—

1. To relieve the pain and tenesmus in acute cases.
2. To avoid all irritation of the inflamed mucous membrane.
3. To remove foul accumulations from, and to arrest putrefactive processes in, the large intestine (*intestinal antisepsis*).
4. To promote (especially in chronic cases) a restoration of healthy action in the catarrhal and ulcerated mucous membrane.
5. To counteract any morbid infective agent in the body.
6. To support the patient's strength.
7. To prevent the diffusion of the disease by suitable prophylactic measures.

1. Whatever differences of opinion may exist with regard to the free use of opium in acute dysentery—and there are some who object strongly to its administration—there can be none as to the necessity of its limited application, to allay the extreme distress of the patient, until more slowly acting remedies can take effect. There should be no hesitation in attempting at once to relieve the pain and tenesmus in the rectum by the local use of opium. It is not intended to check the action of the bowels by its use, or to lock up offending fæcal masses in the inflamed bowel, but it is simply given to relieve pain and to moderate and modify the morbid painful muscular contractions of the large intestine. For this purpose a morphine suppository is convenient, if it can be retained in the bowel, or opium in the form of a small enema may be given, which may be repeated in half an hour if the first one or two should be quickly rejected. As the anal orifice is often excessively tender and sensitive, the enema must be given gently

and with care, a small flexible tube being used, which should be passed up several inches into the bowel. If there should be any difficulty on account of irritability of the anus, this may be readily overcome by brushing the anal mucous membrane with solution of cocaine. The enema tube should also be well oiled.

Each enema should consist of 15 minims of laudanum with 1 ounce of cold mucilage of starch. Some prefer to give a hypodermic injection of morphine, $\frac{1}{6}$ grain. Whichever method is adopted, it must be remembered that it is only a temporary expedient for the relief of a distressing symptom.* Hot fomentations to the abdomen afford some relief to the griping pain.

2. To avoid all irritation of the inflamed mucous membrane, the patient must keep absolutely at rest, and, in all but the slightest cases, at rest in bed; he must pass his motions into a bed-pan, and not be allowed to resort to a water-closet. The abdominal surface may be gently rubbed with opium liniment and hot flannels kept applied there; hot bottles should also be applied to the feet, and the patient kept thoroughly warm with plenty of blankets.

All irritating ingesta, or food which leaves a residue prone to decomposition, must be avoided. Milk is the best food, if it can be prevented from clotting in the bowel. It may be boiled, and then diluted with iced water, and made alkaline by adding to each glass a few grains of sodium bicarbonate. It is exceedingly undesirable that any undigested curd of milk should reach the large intestine; the milk should therefore be diluted and rendered distinctly alkaline, or it may be peptonised. A little thin arrowroot may be mixed with the milk, and forms a useful and unirritating food, while it prevents the milk forming hard curds.

Great objection has been taken to the use of

* Dr. Washbourn states that he has seen lives saved in South Africa by relieving the distressing tenesmus by morphine suppositories (*Brit. Med. Journ.*, June 16, 1900).

strong meat extracts in dysentery on account of their proneness to decomposition, but we can see no possible objection to light broths and clear soups flavoured with the expressed juice of fresh vegetables, as these leave no solid residue, and they are often grateful and refreshing to the feverish and exhausted patient. Some authorities object even to milk in the most acute stage, and when the tongue is foul they would limit the food to weak chicken broth, barley water or rice water, and a little egg albumin, until the tongue cleans.

Stimulants, unless in cases of much exhaustion, should be avoided, and when given should consist of small quantities of brandy and water or brandy and milk. A teaspoonful of brandy with a tablespoonful or two of warm coffee is an excellent stimulant.

3. The next indication is to remove foul accumulations in contact with the inflamed and ulcerated mucous membrane, and to check the putrefactive processes in the large intestine. This is, in short, to carry out **intestinal antisepsis.** There are two ways of effecting this—(*a*) by gently acting aperients, which will sweep away toxic and putrid accumulations from the intestine; and (*b*) by irrigation, or washing out the intestine by cleansing or antiseptic fluids.

After we have allayed the severity of the pain and tenesmus by morphine or opium, as already described, we need have no difficulty or hesitation in carrying out the present indication.

As an aperient an initial dose of castor oil may be given, and this may be followed, in *amœbic* dysentery, either by the ipecacuanha treatment, or treatment by the aperient sulphates of magnesium or sodium. Both methods are undoubtedly efficacious, and each has its advocates. Washbourn, from his experience in South Africa, considers ipecacuanha and magnesium sulphate both valuable in the disease, but he regards ipecacuanha as the more efficacious, as he has seen it cure cases which had resisted the action of sulphate of

magnesium. This is the more remarkable as in the South African war bacillary dysentery was the more prevalent type.

Ipecacuanha has been given in various ways and doses. Some physicians give it in large doses, 20 to 40 grains every four to twelve hours, according to its tolerance by the patient. Its tolerance is promoted by the administration previously of a dose of opium, or by the addition of some opium to each dose of ipecacuanha.

The patient having been kept a few hours without food, the plan usually adopted is first to quiet the stomach by a dose of opium (10 minims of Battley's solution will suffice), and then to give, an hour afterwards, 30 grains of powdered ipecacuanha suspended in as little mucilage and water as possible, so as to avoid its rejection by vomiting; or the ipecacuanha may be made up into small pills coated with keratin, so as not to be dissolved in the stomach. The patient is told to keep very still in bed and to try and not vomit. A little ice may be sucked, or a tablespoonful of iced water swallowed. After four to eight hours another dose should be given, and the remedy should be continued for some days, if necessary, in diminishing doses.

Ipecacuanha has also been given in the form of *enemata*, and we may resort to this method when we encounter great intolerance of this drug by the stomach, and in young children. One or two drams of the powder should be infused in 10 ounces of boiling water, and, when cold, a half or the whole of this may be injected with a long tube into the bowel. It has been stated that ipecacuanha from which the emetine has been extracted—*ipecacuanha sine emetina*—is equally useful in dysentery, and has the advantage of not causing vomiting even in large doses. But experience with this form in South Africa has not been satisfactory, and it is doubtful if it can take the place of the unaltered drug.

On the other hand, Leonard Rogers* has reported

* *Lancet*, Oct. 19, 1912.

striking results from the use of emetine hydrochloride in acute amœbic dysentery, far in advance of the results he has obtained from ipecacuanha, both in relief of symptoms and in reduction of mortality. He gives $\frac{1}{2}$–$\frac{2}{3}$ grain hypodermically (equal to 45–60 grains of ipecacuanha) twice a day for the first two days in severe cases, and then once for another day or two, which is usually sufficient for a cure. When the hypodermic method is impracticable, he has given $\frac{2}{3}$ grain by the mouth on an empty stomach, without producing material sickness, and with very good results. Children of about 7 years will tolerate $\frac{1}{3}$ grain subcutaneously. Rogers also uses a solution of emetine hydrochloride—1 grain to the ounce of water—for flushing the cavity of an amœbic abscess of the liver, after aspiration of its contents. In this manner, followed by subcutaneous dosage of the salt, he claims that incision and drainage may often be avoided.

The experience of American physicians is less favourable to the ipecacuanha treatment, and they prefer the use, in acute cases, of the **aperient sulphates.*** Magnesium or sodium sulphate † may be used, and in the following manner: One dram dissolved in half an ounce of water is given every hour until the motions become fæcal, and continued, less frequently, for twenty-four hours. Now that the distinction in character between *amœbic* and *bacillary* dysentery is clearly established, we fancy little doubt remains in the minds of most physicians, that the ipecacuanha treatment is the treatment *par excellence* of the amœbic form, while active evacuation by aperient sulphates is indicated in the bacillary form, until the bowels are thoroughly cleansed.

This method is really antiseptic and eliminative, as it aims at sweeping away from the intestines irritant toxic and putrid substances.

* *See* Hare's "System of Practical Therapeutics," vol. ii., p. 481 (2nd edit.), 1901.

† See *Brit. Med. Journ.*, Feb. 10, June 16, and Dec. 12, 1900; and Jan. 26, 1901.

A more direct way of carrying into effect the indication we are considering, and a useful supplement often to the preceding, is the **irrigation** of the large intestine by **antiseptic** fluids; it is, however, more applicable to subacute and chronic than to acute cases, on account of the irritability of the rectum and of tenesmus.

A solution of borax, 5 grains to the ounce, or of borax and bicarbonate of soda, 5 grains of each to the ounce, with a few drops of spirits of camphor or tincture of eucalyptus, makes an excellent irrigation fluid for this purpose. The solvent action on mucus of the alkaline solution helps to detach and bring away foul inspissated mucous masses adherent to the diseased membrane, and to cleanse the surface of the ulcers and promote their healing. No treatment can be more rational or respond more directly to the anatomical and symptomatic indications of the disease than this method of antiseptic irrigation.

Normal saline solution is another excellent irrigating fluid for acute cases. Berther speaks very highly of methylene blue ($1\frac{1}{2}$ grains to the pint). These irrigating fluids should be given at body temperature. If the rectum is very irritable it will be well to prepare the way by introducing a suppository of cocaine or belladonna.

Various other substances have been used as enemata in dysentery—some of them more for their astringent than their antiseptic action. But *in acute cases the simple and unirritating antiseptic enemata already mentioned are the best.*

Large irrigating injections of solution of nitrate of silver, 20 or 30 grains to the pint, have found much favour with American physicians. Osler insists on the necessity of large injections of from 3 to 6 pints, the warm fluid being allowed to flow into the bowel through a long tube. He has also used warm injections of quinine, 1 in 1,000 to 1 in 5,000, in amœbic dysentery, with great benefit. The amœbæ are rapidly killed by it.

Iodine, too, has been employed with advantage, in the proportion of 20 to 30 minims of the tincture to an ounce of water.

Thymol (1 in 2,500) is said to be a very effective agent in destroying the *Amœba dysenteriæ*.

Salicylic acid, charcoal, chlorine water, creasote emulsions, perchloride of mercury, and decoctions of bark and chamomile have all been advocated for the same purpose, and some use simple iced water.

Enemata of creolin, $\frac{1}{2}$ per cent. or 1 per cent. solution, have been used with much success by some Continental physicians. Large enemata, from 4 to 6 pints, have been given, twice or three or four times a day. They are said to be absolutely non-irritant to the bowel.

In amœbic dysentery some of the amœbæ bury themselves in the tissues of the bowel and thus keep up the disease indefinitely. It is exceedingly difficult to get at them in this situation, even by antiseptic irrigations, as the fluid does not penetrate the tissues. It is known, however, that at a temperature of 70°F. the amœbæ are destroyed, and with this in view copious irrigation with water cooled below 45° F. has been used with success. It is well to add simple antiseptics to combat any associated secondary infective organisms. The rapidity of the cure depends on the ability of the patient to tolerate and retain large amounts of cold water. Where only small amounts can be retained at a time, the enemata must be given much more frequently.*

That this treatment by irrigation should be successful it must be carried out by the physician himself or a thoroughly trustworthy assistant, so that the whole colon may be irrigated. From 3 to 4 pints are as much as can be safely introduced in the adult. The patient should lie on his back or on his left side, with his head low and the hips raised, and the injection be introduced slowly by a funnel, or fountain and tube. "This should always be done

* *Journ. of Amer. Med. Assoc.*, Oct. 8, 1904.

under low pressure and slowly, in order that the fluid may have time to distribute itself beyond the points of entrance. This will avoid the danger of over-distension and possible rupture of the thin-walled intestine when ulceration has occurred." * If pain is complained of, we must desist injecting for a few minutes, and then inject more, until the maximum possible is reached.

It has been said of these irrigations and large enemata that "they cause great distress and no appreciable benefit," and that they are "risky,"† owing to the ulcerated and softened state of the coats of the bowel; and that they cannot be made to reach the cæcum except by "violent massage"! To apply "violent massage" ought not to be thought of, and the mere suggestion of such a proceeding excites the suspicion that insufficient caution and care in the application of this method has led to these objections to it.

Musgrave‡ recommends as an adjuvant in preventing fermentation in the stomach and bowel acetozone in 1-in-5,000 to 1-in-2,000 solution. From 1 to 3 litres may be taken in twenty-four hours. It can be rendered palatable by making the solution in carbonated water, and storing in siphons.

4. The next indication has been to a great extent anticipated in the preceding, for intestinal antisepsis properly carried out is better calculated than any other means to promote a restoration of healthy action in the catarrhal and ulcerated mucous membrane. But in chronic and sometimes in acute cases the catarrhal state set up by the disease in the intestinal mucous membrane needs the employment of **astringent** remedies.

Bismuth (the subnitrate, carbonate, or oxychloride) is one of the best remedies for this purpose.

* Hare's "System of Practical Therapeutics," vol. ii., p. 483 (2nd edit.), 1901.

† Watkins-Pitchford, *Brit. Med. Journ.*, Nov. 10, 1900.

‡ *Journ. of Amer. Med. Assoc.*, April 8, 1905.

Twenty grains of the subnitrate with 5 grains of Dover's powder, 5 grains of light magnesia, a dram of mucilage of tragacanth, and an ounce of infusion of simaruba may be given twice or thrice a day. Much larger doses of bismuth than this have been given—30 to 60 grains every two hours; these large doses act, perhaps, as much by their antiseptic as their astringent property. Stronger astringents are sometimes required—a dram of tincture of catechu may be added to each dose of the preceding, or 10 grains of extract of logwood.

In old and obstinate cases, acetate of lead (4 grains of the pil. plumbi cum opio three times a day, or a suppositorium plumbi cum opio twice a day), or sulphate of copper ($\frac{1}{4}$ grain in a pill with 3 grains of Dover's powder, three times a day, or a rectal injection of 10 grains of sulphate of copper, 20 minims of tincture of opium, and 4 ounces of water), or nitrate of silver ($\frac{1}{4}$ grain made into a pill with 2 grains of kaolin ointment, and with or without $\frac{1}{2}$ grain of powdered opium, three times a day), have all been found useful.

5. The fifth indication is to correct any morbid infective agency in the body. It seems probable that ipecacuanha may act as a microbicide to the *Amœba dysenteriæ* and arrest the development of the specific germ of this disease.

Shiga prepared a serum which is both bactericidal and antitoxic to his *Bacillus dysenteriæ*. Kruse and Flexner have also prepared sera on similar lines. These various sera have now been abundantly tested in acute cases of bacillary dysentery, but it cannot be said that results have fulfilled the high expectations entertained. The use of these sera in the initial stages of the attack has been supplemented in the later stage by the employment of anti-dysenteric vaccines, mainly of the Kruse-Shiga type. Promising results have been obtained, which seem to suggest their efficacy in forestalling a tendency of the condition to become chronic.

In cases in which the dysentery is clearly asso-

ciated with malarial intoxication, quinine must be given in full doses.

Maclean recommends that 20 grains of quinine in solution (we would suggest in lemon juice) should be given before the ipecacuanha treatment is begun, and that then these two drugs should be given alternately until the characteristic effects of both are produced.

In chronic malarial cases it may be desirable to prescribe arsenic; $\frac{1}{50}$ grain of arsenious acid, or $\frac{1}{12}$ grain of arsenate of soda, gradually increased, may be given in a pill three times a day after food.

6. We must support the patient's strength by nutritious **food.** During the onset of the acute attack little food should be given, as little can be assimilated, and the residue would simply act as decomposing foreign substances irritating to the diseased intestine. Milk is, as we have said, the best food in these cases, diluted with water or barley water, or mixed with a little thin arrowroot. If we notice that curd of milk passes in the stools, we must replace the milk by whey or weak animal broths and thin soups.

In carrying out the ipecacuanha treatment, if much nausea and vomiting is excited, it is important, in order that the patient's strength be not exhausted, that sufficiently long intervals between the doses should be allowed for the administration and assimilation of nourishment.

If there is great prostration, alcoholic stimulants must be given: a pure spirit, either brandy or whisky, or sound port or Burgundy, mixed with water, may be prescribed in the quantity necessary. Ether and caffeine hypodermically, and saline injections, have been employed with success in cases in which life appeared to be endangered by hæmorrhage and anæmia, with prostration and collapse.

After the severity of the acute stage is over, and when appetite and digestive power have returned, a more liberal diet should be allowed. Eggs, whipped up with boiling water, and a little nutmeg and brandy and cold milk added, are an agreeable and

highly nutritious form of food. Pounded sweetbread or chicken, or finely-divided raw meat, or pounded meat and crumb of stale bread may be added to broth, clear soup, or thin cocoa. In the convalescent stage tender meat, fowl, fish, eggs, milk, ripe fruits, and fresh vegetables may be given at suitable intervals, and in proportion to the digestive capacity.

We should seize the earliest opportunity of further supporting the patient's strength by suitable tonic medicines. Bark, quinine, nux vomica, simaruba, nitro-hydrochloric acid, the several preparations of iron, may all in their turn, alone or combined, be given with advantage.

Dujardin-Beaumetz maintained that there was only one treatment for **chronic** dysentery, viz. an exclusive milk diet: best taken, together with baths, at Vichy. But if this is impossible much may be done by the use of antiseptic and astringent irrigations on the lines already indicated. In chronic cases with pain along the course of the colon, an ice-bag applied locally for two or three hours at a time will give great relief.

Change of climate is often necessary to restore completely the strength of the dysenteric patient. A sea-voyage, removal to a bracing sea-coast, or a moderately high mountain resort, or a dry, bracing upland, may be chosen, according to circumstances.

If troublesome constipation be a sequel, a course of mineral waters at Carlsbad, Kissingen, Tarasp, or Brides-les-Bains may prove very serviceable.

Obstinate cases of chronic dysentery, that resist protracted and thorough medical treatment, may sometimes be cured by **colostomy** or **appendicostomy** and flushing the bowel daily with antiseptic solutions by way of the artificial opening.

7. We finally come to the important indication of adopting **prophylactic measures.**

One of the most important of these is the proper treatment of the dysenteric stools. They should either be mixed with sawdust and burnt, or buried in

the soil a few feet below the surface, boiling water having been previously thrown on them. They must not be emptied into water-closets or privies. If it is not possible to avoid this, they should be first treated freely with carbolic acid and boiling water. The sick-room should be well ventilated with open windows, the bedding frequently changed, and all articles soiled by the discharges plunged into boiling or very hot water.

Individuals exposed to contagion and during epidemics should avoid all predisposing causes. All drinking water, unless absolutely free from possible suspicion, should be boiled, and milk also. All articles of food should be avoided that have any tendency to excite intestinal catarrh, and that are indigestible, as unripe fruit, coarse vegetables, etc. Avoidance of foul latrines and water-closets should be insisted upon. Warm clothing—and especially a flannel band round the abdomen—should be worn, as chill predisposes to most infectious diseases. Removal from the infected area, when possible, is, of course, advisable.

In the management of armies and other large bodies of men it is especially important to look to the supply of drinking water, to avoid overcrowding, to provide proper food, well cooked, and to secure habits of personal cleanliness and the proper disposal of refuse.

Simple Ulcerative Colitis

We must allude here to this condition, which, though it closely resembles dysentery, and may indeed in its inception be due to the same causes, is probably maintained in its later stages by the activity of other organisms. Like dysentery, ulcerative colitis may run an acute or a chronic course. The characteristic features are profuse and persistent diarrhœa, diffuse abdominal pain and tenderness, and progressive wasting and exhaustion, generally terminating in death. The fluid motions contain varying

proportions of blood and mucus. Some elevation of temperature is a common feature of the disease.

The main **indications for treatment** are the same as in the case of dysentery, apart from measures directed against *specific* causes. In ulcerative colitis attempts have been made to deal radically with the condition by means of vaccine-therapy. Cultures may be taken either direct from the bowel by the aid of the sigmoidoscope, or from mucus passed in the motions, and the agglutination test will help in identifying the causal organism or organisms from which to prepare an autogenous vaccine. Hale White has reported cases in which cure has apparently resulted from the employment of an autogenous vaccine of the colon bacillus. Better results may be looked for in the future from the combination of vaccine-therapy with irrigation of the colon through the artificial opening provided by an appendicostomy or colostomy.

ADDITIONAL FORMULÆ

Astringent pills in dysentery

℞ Argenti nitratis, gr. ⅛.
Pulveris opii, gr. ⅓.
In pil. To be taken an hour after meals. (*Packard.*)

Enemata in dysentery

Various *antiseptic* and astringent substances have been successfully applied in enemata. Free irrigation with warm water has been found as useful as any. (*Korytin.*)

One per cent. solution of carbolic acid.

Bichloride of mercury, daily injection of 7 oz. of a 1 in 5,000 solution.

℞ Quininæ sulphatis, gr. x.
Tincturæ camphoræ compositæ, ʒiv.
Decocti amyli ad ʒj.

This, warmed, is to be injected slowly *after* the bowel has been washed out with 1½ pints of warm water. (*Poynder.*)

Creolin, 1 dram to a pint of water. (*Watson.*)

Alum, ½ oz. to ½ pint of water twice daily. (*Hepburn.*)

Bisulphide of carbon, 1½ gr. in 1½ oz. of water twice daily. (*Jakotleff.*)

Sulphate of copper, 10 grains with 1 dram of laudanum and 4 oz. of water. (*Easby.*)

℞ Argenti nitratis, gr. ij ad gr. viij.
(For children, gr. jss.)
Aquæ destillatæ, ʒv.
To make four enemata, two to be given daily. (*Bamberger.*)

℞ Naphthalini, gr. lxxv.
Olei olivæ, ʒv.
To be injected high up three or four times a day. (*Minerbi.*)

Suppositories for dysentery

℞ Acidi tannici, gr. xv.
Opii, gr. iij.
Olei theobromatis, ʒijss.
To make four suppositories. (*Bamberger.*)

Another suppository

℞ Naphthalini, ʒijss.
Olei theobromatis, ʒijss.
To make five suppositories.
(*Minerbi.*)

Mixture for acute dysentery

℞ Magnesii sulphatis, ʒj.
Acidi sulphurici diluti, ♏xv.
Aquæ menthæ piperitæ ad ℥j.

M. f. haustus. To be taken every hour until the stools become fæculent. (*Day.*)

Antiseptic and sedative mixture in acute dysentery

℞ Izal, ♏iij.
Bismuthi subnitratis, gr. x.
Tincturæ chloroformi et morphinæ, ♏viij.
Mucilaginis acaciæ ad ℥j.

M. fiat haustus. To be taken every two, four, or eight hours, according to the severity of the symptoms.
(*Watkins-Pitchford.*)

Medicated enemata for amœbic dysentery

Quinine sulphate, 1 in 5,000 to 1 in 1,000.
Perchloride of mercury, 1 in 10,000 to 1 in 5,000.
Hydrogen peroxide, 1 in 20 to 1 in 5.
Methyl blue, 1 % to $\frac{1}{10}$ %.
The enema should be given once or twice a day. (*Aderhold.*)

In membranous colitis and in chronic dysentery

copious injections containing bismuth have been found very efficacious. Three drams of bismuth subnitrate and 3 drams of sodium salicylate are mixed with a pint of mucilage (of quassia seeds). The colon is first cleaned out with a castor-oil enema and then with one of solution of boric acid. The bismuth injection must be retained, if possible, for twenty-four hours. To ensure this a smaller quantity may have to be given. (*Revilliod.*)

CHAPTER XII

TREATMENT OF DISEASES OF THE INTESTINES: INTESTINAL OBSTRUCTION

INTESTINAL OBSTRUCTION, Acute and Chronic: Its Nature and Seat often difficult to ascertain—Its Causes—(1) Accumulations within the Canal—(2) Compression or Constriction from without—(3) Stricture, Malignant, Cicatricial—(4) Strangulation or Incarceration, External and Internal—(5) Positional Lesions (Intussusception, Twisting, Kinking, etc.)—(6) Paralytic or Subparalytic Condition of the Intestinal Walls—Diagnostic Measures—Rectal Exploration—External Manipulation—General Symptoms—Acute Intussusception—Its Symptoms—Gall-Stones—Previous Attacks of Peritonitis—*Treatment* of Simple Compression or Traction—Fæcal Impaction—Stricture—Caution in use of Opium—Belladonna—External Applications—Ice—Warmth—Intussusception Cases—Injection of Water—Puncture to relieve Distension—Nutrient and Supporting Enemata—Operative Measures—Diet.

OBSTRUCTION or closure of the intestinal canal may arise from a variety of causes, but certain symptoms are necessarily common to all. The chief clinical and symptomatic distinctions will depend upon whether the closure of the intestine has been brought about suddenly and unexpectedly, or slowly and gradually; whether, in short, it is what is termed acute or chronic.

Certain differences also in the clinical manifestations will arise according to the situation of the obstruction, i.e. according as it is situated in the upper or lower part of the intestinal canal, and further, according to the completeness or incompleteness of the obstruction.

Although from the similarity, and, in many instances, the identity of the phenomena attending these cases, the treatment appropriate to them is the same, even when their causal relations remain obscure, yet in all instances, in order to institute the most appro-

priate treatment, it is desirable, and in many cases it is essential, to arrive at an accurate estimation of the nature and seat of the obstruction. It will, therefore, be necessary to review briefly the chief causes of intestinal obstruction, and to mention whatever distinctive symptoms have been observed to characterise the different varieties.

1. The intestinal canal may be blocked by substances that have **accumulated within it**—such as indigestible substances taken with the food, or foreign bodies of any kind, insoluble matters taken in the form of medicines (large and repeated doses of peroxide of iron or magnesia), masses of intestinal worms or of indurated fæces—and by large biliary and intestinal concretions. (Gall-stones large enough to obstruct completely the small intestine sometimes ulcerate their way from the gall-bladder into the intestine through the walls of both ; calculous deposits also occasionally form within the intestinal canal itself, composed generally in great part of concretions of phosphate and carbonate of lime.)

2. The intestine may be obstructed by **compression** or **constriction** arising externally to it. Tumours, glandular, vascular, or visceral, benign or malignant, or displaced viscera, may compress adjacent intestine, and cause its partial or complete occlusion. In this way the rectum may be compressed by a displaced uterus, or by a uterine or other pelvic tumour.

Sometimes one portion of diseased or displaced intestine may compress another, either by its own weight, or by dragging on its mesenteric attachment.

Constriction may also depend on chronic peritonitis matting together portions of the intestine. Lane has stated that not infrequently adhesions develop in consequence of the inflammation induced in the wall of the gut by chronic constipation, and lead to varying degrees of chronic obstruction of the large bowel. The cæcum and ascending colon are most often affected, as here in the erect posture the ileum readily discharges itself into the cæcum, but

the overloaded cæcum has an uphill task to drive its contents upwards along the ascending colon. The result is great over-distension, and the formation of pericæcal adhesions.

3. **Stricture** is a common cause of obstruction, especially of the rectum and large intestine. This may be, and frequently is, malignant, and dependent on a cancerous growth in the intestinal walls, or it may be simply cicatricial, the result of the healing of dysenteric, syphilitic, or other forms of intestinal ulceration. Simple hypertrophic stricture is rare. Obstructing polypoid growths occasionally occur.

4. Obstruction may be due to **strangulation** or **incarceration** of the intestine, as in herniæ. External hernial protrusions are obvious, and readily recognised, but the strangulation may be internal. A portion of intestine may get incarcerated by fibrous bands stretching across it—the result of former peritonitis; or it may get into an accidental or congenital fissure in the omentum or mesentery, or into some natural aperture, as the foramen of Winslow, or one of the openings in the diaphragm. Or strangulation may be caused by the vermiform appendix or a diverticulum from the intestine becoming adherent by its free end, and so forming a kind of ring in which the intestine may be caught.

5. **Positional lesions** of the intestinal walls. Under this heading we must group cases of intussusception or invagination, as well as those dependent on twisting, rotation, or a sudden bend of the intestine.

6. A **paralytic** or **subparalytic** condition of the intestinal walls. This condition is dependent on a variety of causes, as—(*a*) local injury, surgical or accidental; (*b*) fatty degeneration of the muscular coat of the bowel in cases of excessive obesity; (*c*) hysteria; (*d*) the degenerative changes of old age; and (*e*) extreme nervous and muscular exhaustion following infective fevers.

It is apparent from this survey of the various causes of intestinal obstruction that a great number of

these cases are not amenable to medicinal treatment, and that they can only be remedied by surgical interference. It is not possible in every case to determine, at once, with accuracy the cause of the obstruction, and in doubtful cases we should summon surgical assistance, so that the patient's life may not be endangered by hesitation or delay.

A thorough and systematic examination of every case will, however, usually enable us to arrive at an approximately accurate diagnosis.

We will assume that the possibility of the case being one of acute peritonitis has been considered and eliminated, and that the possible existence of a strangulated external hernia has not been overlooked.

In an old person, or one of middle age, the frequency of obstruction from fæcal accumulation, or from stricture of the rectum or sigmoid flexure, will point to the propriety of an immediate digital examination of the rectum, which in the case of the rectum would at once detect the existence of a fæcal accumulation or the presence of stricture. Stricture situated in the sigmoid flexure may call for the use of the sigmoidoscope or the passage of bougies. Obstruction from **fæcal accumulations** is usually preceded by habitual constipation, and the occasional passage of very large motions. Fæcal tumours may often be felt in the course of the colon, and we may find that a like attack has occurred before, and been relieved by free evacuation of fæces. Pelvic tumour compressing the rectum would also be detected by careful examination made by the rectum and vagina, together with external manipulation.

If the patient should be a child, and the case be one of intussusception, a rectal examination would also be of value, for if the invaginated mass had made its way into the rectum, as it sometimes does, we should be able to detect its presence there. With one hand on the abdomen, rectal examination will sometimes detect an intussusception swelling that cannot be otherwise felt.

Much assistance in diagnosis may be derived from the consideration of the mode of onset of the obstruction, whether acute and sudden, or chronic and gradual; we should also endeavour to determine whether it is situated in the small or large intestine.

Severe and early vomiting, intense pain, scanty urine, and, generally speaking, the acuteness and rapid progress of the case, point to the small intestine as the seat of the lesion; while less severe pain, less tendency to vomiting, and average flow of urine, also a gradual onset and slower progress of the case, point to the probability of the obstruction being in the large intestine. Evidence, on percussion over the lumbar and epigastric regions, of great distension of the colon, would naturally point to the obstruction being in the large intestine, while, on the other hand, evidence of a non-distended and contracted condition of the colon would indicate that the obstruction was in the small intestine, a conclusion which would be strengthened by the presence of much distension and flatulent commotion in the umbilical and hypogastric regions.

If we are satisfied that the obstruction is situated in the small intestine, and if the patient is a young child, we should first think of intussusception. This is usually acute, the rare cases of chronic intussusception being commonly observed in young adults. The characteristic symptoms of **intussusception** are sudden and severe, but intermitting, colicky pains, diarrhœa and tenesmus, with mucus and blood in the stools, the detection of a sausage-shaped tumour in the abdomen, increasing in size, and changing its position, and the possibility, occasionally, of feeling the terminal part of the invaginated gut in the rectum.

Obstruction by **gall-stone** is usually situated in the small intestine, between the duodenum and the ileo-cæcal valve, in the neighbourhood of which it may be arrested. It usually occurs in middle-aged women, and, in favourable circumstances, a correct diagnosis

seems possible. When the stone passes into the duodenum, it commonly excites intense pain and vomiting. These symptoms tend to subside while the stone is passing along the jejunum, and to recur when it is arrested at the lower narrow part of the ileum. If the ileum is completely blocked, there will be all the symptoms of acute intestinal obstruction.

The history of previous attacks of **peritonitis** will lend probability to the existence of adhesions between coils of intestine, or the presence of constriction from bands of adhesion. But these, and many other conditions, such as twisting, strangulation by Meckel's diverticulum, etc., it is impossible to diagnose with any approach to certainty. Even adhesions due to previous indolent peritonitis are often found, without any history of antecedent peritonitis.

Careful physical examination of the abdominal cavity should enable us to detect the existence of any tumour capable of causing obstruction of the intestine by compression.

In considering the **treatment** of cases of intestinal obstruction we shall deal with the simpler ones first.

When the obstruction is ascertained to be caused by the compression or traction of an abdominal or pelvic tumour, or an enlarged or displaced viscus, our efforts must be directed to the mechanical removal of this pressure or traction. We may be enabled by manipulation and posture to shift the position of a tumour of the abdomen or pelvis and retain it where its pressure will be removed, if not permanently, yet so as to admit of the introduction of an enema or the action of a laxative, pending surgical intervention. In such cases it will also be necessary to soften any accumulation of fæces above the point of compression, by gentle laxatives and by large enemata, the quantity of fluid injected being regulated by the situation of the obstruction. Warm soap and water, with 2 or 3 tablespoonfuls

of olive oil added to it, is the best enema to use. If there has been a prolonged retention of fæces so that they have become very hard, and if there is no great urgency in the case, it is often a good plan to inject with a long tube, passed up as far as it will easily go, 4 ounces of olive oil, and to let it remain for twelve or twenty-four hours, when a large enema of warm soap and water may be given, and repeated until all the hard accumulated fæces have been evacuated. A tablespoonful or two of castor oil mixed with a little warm milk may at the same time be given, or 2 or 3 grains of calomel followed by a draught containing 3 or 4 drams of sodium sulphate and ½ ounce of tincture of senna in 2 ounces of peppermint water. After the bowels have thus been thoroughly relieved it may be desirable to give a daily aperient, so as to keep the motions semi-fluid or soft, and prevent future accumulations. A teaspoonful of a confection consisting of equal parts of the confections of sulphur and senna of the B.P. may answer this purpose; or a daily dose of 2 or 3 teaspoonfuls of Carlsbad salts dissolved in half a pint of hot water. The diet, also, should be so arranged as to favour fluidity of the motions.

When the obstruction is due to **impaction of fæces** in the large intestine, the indications for treatment are obvious. Hard fæculent accumulations in the rectum that can be reached by digital exploration may require to be broken down and removed by the finger, aided by a metal scoop or any suitable blunt instrument, under general anæsthesia. The rest of the treatment for these cases and for the accumulations higher up in the large intestine must be conducted much in the same manner as that just described for accumulations from compression. Many, and rapidly-repeated, large enemata, introduced high up by means of a funnel and siphon tube, will be required to get rid of accumulations in the first and second portions of the colon, and the enemata must be retained as long as possible in order to exert the necessary softening effect;

they should, therefore, be given in the knee-and-left-shoulder position, with head and shoulders depressed; or the pelvis may be raised on hard pillows or cushions. In this and in all forms of intestinal obstruction the enemata should be given by the medical attendant himself, who will know how best to promote the ascent and retention of the fluid. Gentle laxatives should be given at the same time by the mouth, as above described.

In obstruction from **stricture,** which is usually situated in the rectum or sigmoid flexure of the colon, the treatment will depend on the nature of the stricture, whether innocent or malignant, and its exact location; if the stricture is innocent and is not complete, and if it can be reached by the finger or a rectal bougie, it may sometimes be cautiously dilated and the accumulations above it softened by enemata of warm water or warm soap and water with olive oil, or an enema of olive oil alone, at first, as already mentioned, which may be injected by means of a small tube passed through the stricture. At the same time, laxative medicines should be given to soften and make fluid the evacuations, and these should be continued so long as the stricture remains. Dilatation of any malignant stricture is quite impracticable, and attended by grave risks.

In the case of malignant strictures, and of an innocent stricture of the sigmoid, colostomy is the only satisfactory course, and it may be possible subsequently to remove the stricture. If an innocent stricture of the rectum be so narrow as to cause complete obstruction, it is open to question whether colostomy is not the safer course, as the bowel wall adjacent to the stricture will be inflamed and soft, and easily lacerated by the passage of bougies.

Simultaneously in all these cases, if much abdominal pain exists, as may be the case from flatulent distension of the intestine, **opium** must be given to relieve the pain, but only in small

quantity, and just sufficient to relieve the pain and no more: 5 to 10 minims of liquor opii sedativus may be given with a dose of castor oil, and repeated with a second dose if the pain is not relieved. Or a hypodermic injection of $\frac{1}{6}$ grain of hydrochloride of morphine and $\frac{1}{120}$ grain of sulphate of atropine may be given, and repeated after three or four hours if needed.

But in intestinal obstruction it is exceedingly important to be sparing and careful in the use of opium, and to remember that it is better, when possible, to avoid the use of opium at all; for opium tends to paralyse the muscular walls of the intestine, and if given in large and repeated doses, especially in old people, it will do this so effectually that it will be exceedingly difficult to rouse the over-distended and subparalytic intestine to activity, and a fæcal obstruction, especially when situated high up, may be rendered immovable, or, at any rate, very difficult and tedious to remove. It is in cases of intestinal obstruction due to mechanical causes, in which the only probability of relief lies in surgical operation, that we must be careful not to lull ourselves into a state of mistaken security by the incautious administration of opiates.

Necessary as the judicious use of opium is in the treatment of some cases of intestinal obstruction, we have seen much harm result from its indiscriminate employment, and we consider the common dogma that "in intestinal obstruction opium is our sheet anchor" mischievous and dangerous, for it leads the young and inexperienced practitioner to give opium largely and indiscriminately in all these cases.

The same objection does not apply in the same degree to **belladonna**, and Bryant has warmly advocated its use in these cases, applied externally, the extract mixed with glycerine and given internally, with or without opium.

In all cases, however, of acute obstruction, or obstruction attended by acute symptoms, suggestive

of enteritis or peritonitis, or intestinal spasm, opium may be given, although it must honestly be admitted, seeing that nine out of every ten such cases end fatally, that the opium, in the great majority of instances, simply contributes to euthanasia! Dr. Hunter McGuire, referring to the use of opium in these cases, observes: "*To carry it farther than slight narcosis and arrest of the most painful symptoms of obstruction is an abuse of the remedy.* By such abuse the symptoms will be masked, and both patient and practitioner deceived." *

The application of pounded ice to the abdomen will do something to subdue pain, and perhaps it lessens the risk of peritonitis; but warm applications are generally more soothing and grateful to the patient, such as hot flannels or a hot linseed-meal poultice well sprinkled with laudanum.

Obstruction from a large gall-stone in the small intestine has been successfully treated by rest, small doses of opium, and abdominal massage; but these measures should not be persisted in, to the undue delay of opening the abdomen.

In the case of **intussusception** early laparotomy and reduction of the intussusception is the only justifiable course. But if for any reason operation is impracticable, then, after quieting the patient, and relieving pain by the use of chloroform, attempts must be made to reduce the invagination mechanically. In order that these may be successful, they must be made early, before time has been allowed for the invaginated portion to become adherent or gangrenous. We should first push back the mass in the rectum with the fingers or a sponge sound, the sponge being well oiled, and applied with firm but gentle pressure. By this means we may partially reduce the invagination, and we should then endeavour to complete it by the injection of a considerable quantity of warm water or milk. It is usual first to place the patient under the influence of an anæsthetic, and in a position which

* Pepper's "System of Practical Medicine," vol. ii., p. 863.

will mechanically favour the replacement of the intestine. Even so we cannot be sure that reduction is complete; and even if complete, the local condition remains such as to favour early recurrence.

For the relief of the extreme distension of the intestines by pent-up gases, which cause so much distress in many of these cases, puncture with a fine exploring trocar has been advocated. The trocar should be carefully disinfected by passing it through the flame of a spirit lamp, and it should be plunged into such parts of the intestine as appear from percussion to be specially distended and superficial. By removing the accumulated gas we relieve the intra-intestinal pressure, as well as the dyspnœa caused by the meteorism. It must be remembered that the trocar may sometimes pass between the coils of intestine, but this is of no consequence, and when there is great distension it cannot be difficult, with care, to avoid this. This method is, however, condemned by many "because of its blindness and inadequacy." A much more satisfactory procedure, and one that requires very slight surgical skill, is to make a small incision in the abdominal wall, and fix a distended coil to it. A small incision should then be made in the convex border of the gut and a Paul's tube fastened into the aperture by means of a purse-string suture. A piece of rubber tubing can be attached to the projecting end of the tube to carry the contents to a vessel placed beside the bed. The whole operation may be done under local anæsthesia.

An important point in the management of these cases is to support the strength of the patient and ward off fatal collapse by the administration of suitable nourishment. When the obstruction is high up and there is much vomiting, it will be necessary to have recourse to frequent small enemata of unirritating substances. A few ounces of warm peptonised milk or beef-tea, with a small quantity of brandy, will answer the purpose best. A little iced milk or iced coffee and milk may be given by the mouth if agree-

able to the patient, and if it does not excite vomiting. When there is stercoraceous vomiting great relief is often afforded by washing out the stomach with plain water or a weak solution of bicarbonate of soda at a temperature of 100° to 105° F.

"In some cases it produces not only relief, but is absolutely curative. Curschmann ranks washing of the stomach next to opium as a palliative and curative agent. . . . . Plain water may be used, or a normal saline solution, or mild antiseptic lotions." *

But in most cases of acute obstruction, especially when it seems to be in the small intestine, keeping in mind the great mortality that attends these cases under ordinary medical treatment, we should not hesitate to recommend early recourse to surgical exploration. We would repeat our caution as to the use of opium. This drug, when given in large doses, is apt to cast a delusive calm over the aspect of the case, and to lead to a false sense of security; the fact that nine out of every ten such cases end fatally gives little support to the extreme laudation which this drug has received. When given in large quantities in cases of fæcal impaction it induces a subparalytic condition of the intestine and protracts recovery greatly, and, we believe, tends often to an erroneous diagnosis as to the nature of the obstruction.

It is a good rule in all cases of intestinal obstruction of a doubtful nature, especially when the onset and the symptoms are acute, to seek surgical advice and co-operation early in the case, and to regard opium simply as a temporary calmative. Moreover, in the few cases of acute obstruction which recover without surgical interference, it must always be doubtful whether there has been an actual mechanical constriction of the bowel, and whether they are not simply instances of fæcal impaction. Treves observes, no doubt with reason: "In not a few instances the previous treatment has compromised the success

* Professor E. Martin, in "Hare's System of Practical Therapeutics" (2nd edit.), vol. iii., p. 492.

of any interference by operation. The engorgement of the bowel has been increased by aperients, and the *normal reflexes* have been *impaired* or *annihilated* by *excessive doses* of *opium* and *belladonna.*" *

In the **most urgent cases** of acute obstruction, as Treves points out, the chief object of surgical interference is to relieve the "dangerously engorged bowel above the occluded part," and the removal of the cause of obstruction may, and indeed in many cases must, be postponed.

The engorged bowel is "filled up to the very stomach with a foul and fæculent fluid, by which the patient is being poisoned. The gut is paralysed, the normal reflexes are lost, there is no peristaltic wave to free the many bends and twists which must be undone to secure a free passage, and the patient dies with some pints of the foulest and most putrid matter still lodged in a viscus possessed with an instinct to absorb its contents." It is the complete evacuation of this that is the urgent matter.

Enterotomy, Treves goes on to say, "may appear to be a somewhat unsurgical procedure, and not a very brilliant or complete operation, but still it can claim results which appear to indicate the direction in which surgical measures should tend."

No anæsthetic should be given in these cases. The abdomen should be opened in the median line below the umbilicus, and an enterotomy performed. "The incision should be as small as possible, just large enough to allow one distended coil to be drawn forward with the finger. There should be no searching for the cause of the obstruction. Every minute is of consequence. The bowel is rapidly fixed to the parietal wound by a few sutures, which do not penetrate beyond the submucous coat, and the gut may be best evacuated by a large trocar and cannula, to the end of which a long indiarubber tube is fixed. The contents of the gut are thus carried away from the wound. A way for the trocar through the outer coats

* "Operative Surgery."

of the intestine must be made with a scalpel. As the bowel is emptying itself, it may be more accurately secured to the margins of the parietal wound by a few more sutures." The stomach should be washed out, either before or after the operation, with hot water containing some boric acid in solution. The pulse is improved and the patient revived by the hot water. In less urgent cases a rapid search may be made for the obstruction; but if this is not quickly found no time must be lost, and the bowel should be immediately opened.

In other cases still less urgent, after washing out the stomach with hot water, an anæsthetic may be cautiously administered; it must not, however, be pushed to complete insensibility. An incision should then be made in the median line, between the umbilicus and the pubes, large enough to admit the hand, and search made for the site of the obstruction. "As soon as the abdomen has been opened, three fingers may be introduced and the cæcum examined." If the cæcum is empty, the obstruction is in the small intestine; if distended, then probably in the colon; and the direction of the further search is determined accordingly.

"After the cause of the obstruction has been found and relieved, it will in very many instances still be wise to evacuate the distended bowel. The opening made may be closed as soon as the gut is considered to have sufficiently emptied itself; but it may with greater safety be left open for the time being, and be closed by subsequent operation."

An impacted gall-stone or enterolith should be moved upwards into the distended and healthier bowel, and dealt with there, by removal by an incision in the free border of the bowel, and in its long axis. If the gut should be gangrenous at the obstructed part it must be resected, or a temporary artificial anus made, which can be closed at a later date.

In cases of paralytic distension the passage of

the rectal tube is often of much service, especially at the onset of such cases. "It excites peristalsis, and, by overcoming the resistance of the sphincter, relieves tension by allowing quantities of gas to escape." In such cases also saline purgatives will be found of great utility.

"Administered in the first stage, before paralysis has fairly developed, they seem to have the power of re-establishing peristalsis, of restoring tone to the muscular coats of the bowel, and of sweeping from the intestinal tracts the partially-digested matter ripe for fermentation and putrefaction. . . . Salines, then, should be administered freely in the beginning of this form of obstruction." * They must not, however, be used in advanced cases where vomiting has set in; in such cases the faradic current, full doses of strychnine, lavage of the stomach, brandy per rectum or hypodermically, may be tried, and as a final resort—when death seems imminent from septic absorption or over-distension—we must have recourse to laparotomy and incision of the bowel, and formation of an artificial anus.

In cases of chronic obstruction, when the disease is in the colon or rectum, iliac colotomy is usually performed, and an artificial anus established.

With respect to diet in cases of acute obstruction, it is obviously irrational to give food or drink by the mouth; at most a little ice-water may be sipped or fragments of ice sucked. Not only is there no digestion or absorption by the stomach, but any food introduced into it will provoke fresh vomiting, and add to the matter undergoing decomposition in the intestine.

Peptonised foods (milk, beef, eggs) and stimulants must be given per rectum. To relieve thirst, we may inject normal saline solution into the subcutaneous tissue, or rectum, or directly into a vein. To relieve threatened cardiac failure and collapse, brandy or whisky may be added to the solution.

* Professor E. Martin, in "Hare's System of Practical Therapeutics" (2nd edit.).

CHAPTER XIII

TREATMENT OF DISEASES OF THE INTESTINES: INTESTINAL PARASITES

TAPEWORMS: Natural History—Tænia solium—Tænia saginata—Bothriocephalus latus—Symptoms—Diagnosis—*Treatment*—Preparatory—Vermicidal—Filix mas—Kousso—Pomegranate—Pelletierine—Turpentine—Kamala—Pumpkin Seeds—Thymol, Chloroform, etc.
LUMBRICI, or ROUND WORMS: Symptoms—*Treatment*—Santonin—Kamala. Oxyuris vermicularis, or Threadworm: Causes—Symptoms—*Treatment*—Difficulties—Enemata—Suppositories—Purgatives—Antiseptics—Tonics. Trichocephalus dispar—Ankylostomum duodenale: Prophylaxis—Thymol—Eucalyptus.
Additional Formulæ.

THE successful treatment of intestinal parasites depends on its adaptation to the different species, and requires a knowledge of the habits and mode of development of each kind. Prophylaxis also must be founded on a thorough knowledge of their natural history. Cleanliness and care in personal habits, and in the selection and preparation of food and drink, will, however, certainly protect us from many species. All animal food should be sufficiently cooked, all suspected water carefully filtered, and more care should be observed in our association with domestic animals.

The seven kinds of parasitic worms peculiar to man chiefly concern us here. Three of these belong to the tapeworm class, viz. *Tænia solium*, *Tænia mediocanellata* or *saginata*, and *Bothriocephalus latus*; four to the class of round worms, viz. *Ascaris lumbricoides*, *Oxyuris vermicularis*, *Trichocephalus dispar*, and *Ankylostomum duodenale*.

TAPEWORMS

The mature tapeworm, as it is found in the intestinal canal of man and other animals, is a

soft, flat, white, tape-like-looking worm, having a small head furnished with suckers, and a circlet of hooks, by which it clings to the mucous membrane. A slender neck succeeds the head, and gradually widens into the body, which is composed of segments (called proglottides) that become larger and larger the farther they are from the neck, until they acquire their full size, when they become detached, singly, or several linked together. The worm has neither mouth nor intestinal canal, but derives its food by imbibition from the intestinal juices in which it lies. The mature segments consist almost wholly of sexual organs of both kinds, and are, therefore, self-impregnating. In the eggs contained in these segments a six-hooked embryo is developed. These eggs when discharged from the intestinal canal, either free or enclosed in the proglottis, for the most part perish, but if they become swallowed by animals, as they sometimes do, then the six-hooked embryo is set free, and by some means or other migrates from the digestive canal into the liver, muscles, or other organs of the animal. In favourable circumstances it there assumes its scolex or larval form. This usually consists of a cyst, with an inverted head and neck resembling that of the parent tapeworm. Now, if the flesh of animals containing these scolices, in an active state, be eaten by another animal, the scolices may be set free by stomach digestion, and passing into the small intestine, the head of the scolex becomes everted, and fastens on to the intestinal mucous membrane, the cyst disappears, and by successive budding another tapeworm colony becomes developed. This brief account of the life history of a tapeworm is sufficient for our present purpose.

For a tapeworm to be developed it is only necessary that a living embryo be introduced into the stomach, and this is usually done by eating animal flesh containing them—the meat being either raw, or cooked insufficiently to kill or arrest the further development of the embryo.

Tænia solium * usually arises from eating imperfectly cooked pork, and **Tænia saginata** from the flesh of the ox. Children are said to have acquired the latter from eating grated raw-beef given them by medical prescription. *Tænia solium* is only found in the human small intestine, usually in its upper third, into the mucous membrane of which the head is very firmly fixed, the neck and the first segment of the worm lying coiled up in a mass around the head. The worm may reach to the lower third of the small intestine, but rarely to the cæcum. *T. saginata*, also peculiar to man, differs from *T. solium* in its head not having a circlet of hooks, in place of which it has a small frontal sucker besides the four powerful sucking discs on its head, which is far larger than that of *T. solium*. It is a much larger, stronger, thicker, and fatter worm, and may grow to a length of nearly 20 yards.

The only other tapeworm frequently found in man is the **Bothriocephalus latus.** It is not, however, like the two preceding, peculiar to the human being, as it has often been met with in dogs. It is the longest of all the tapeworms that inhabit the intestine of man, and may reach 25 yards in length. The head differs in form from that of either of the preceding. It is almond-shaped, and has a long elliptical sucker on each side. It has a dull bluish-grey colour when fresh. It differs further from *T. solium* or *T. saginata* by having its genital orifice in the centre of the brood surface of the segments, not on the margin, and this is always on the same ventral aspect. The uterus, distended with eggs, appears in the mature segments, which are nearly square, or as broad as they are long, as a central rosette-like group of pouches (Fig. 8).

The eggs, if left in water for some months, develop within them a six-hooked embryo. They open by casting off a lid, and then the embryo swims

* The *Tænia solium* in its embryonic state is known as the *Cysticercus cellulosæ*, and dwells in the intermuscular connective tissue and other parts of the pig.

about by means of a ciliated envelope, which is thrown off after four to six days, retaining still a transparent albuminous coat. Its further fate is unknown, but it is thought highly probable that its intermediate state of development takes place in some aquatic animal. The scolices have been found by Braun, of St. Pétersburg, in the muscles, liver, and organs of generation of the pike, trout, and eel-pout, and by causing cats and dogs to feed on these the fully developed tapeworm has been produced. It would, therefore, seem probable that man might be infected by eating such fish raw or insufficiently cooked. This tapeworm has not been found except in Europe, and it is especially frequent in Western Switzerland and in Poland, parts of Sweden, Finland, St. Petersburg, and the Baltic Provinces.

The **symptoms** due to the presence of one or more tapeworms in the intestinal canal may be so insignificant as to escape notice, especially in the case of children, and their existence may not be suspected until the segments are discovered in the motions. In many cases, however, troublesome symptoms due to the presence of the worm in the small intestine make themselves manifest. Vague digestive and nutritive disturbances, unpleasant feelings in the abdomen, sometimes colicky pains, are complained of, most troublesome during fasting, or after particular articles of diet. These are relieved by eating, and especially by certain kinds of food. Sensations of ravenous hunger, feelings of fainting, a sense of distension in the abdomen, diarrhœa alternating with constipation, a feeling as if some foreign body were moving about in the intestines—all these have been complained of in connection with tapeworm. The following reflex phenomena have also been noticed: Itching about the anus, tickling of the nose, salivation, vomiting, headaches, singing in the ears, palpitation, gastralgia, and many convulsive nervous affections, such as chorea, cramp, etc.

So far as diagnosis is concerned, it is commonly

by the observation of segments of the worm in the motions that we conclude a patient has tapeworm. If, however, we have not had an opportunity ourselves of seeing any of these segments, a mild purgative will usually bring away some, if a tapeworm really exists in the small intestine. It must be remembered that it is not uncommon for patients who pass large shreds and strings of tough mucus owing to chronic catarrh

Fig. 6.—Ripe segment of *Tænia solium*. (Magnified 6 diam.)

a, Genital pore.

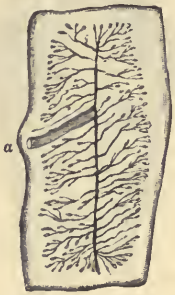

Fig. 7.—Ripe segment of *Tænia saginata*. (Magnified 6 diam.)

a, Genital pore.

Fig. 8.—Ripe segment of *Bothriocephalus latus*. (Magnified 6 diam.)

of the large intestine to regard these as portions of tapeworm.

As *Tænia saginata* is said to be much more difficult to expel than either *Tænia solium* or *Bothriocephalus latus*, it is desirable, before beginning the treatment, that we should ascertain which kind we have to deal with. The segments of *Tænia saginata* (Figs. 7, 9, A) are much stronger, thicker, and more opaque than those of *Tænia solium* (Figs. 6, 9, D).

If we spread out some of the segments on a glass plate, and allow them to dry, we can distinguish the smaller number of lateral branches going off from the uterus in the *T. solium*, from the numerous lateral branches —from 15 to 20—in the segments of *T. saginata*.

The heads of these three kinds are also here figured (Fig. 9) :—

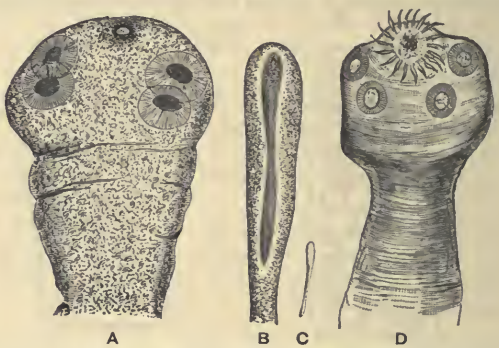

Fig. 9.—A, Head of *Tænia saginata*. B, Head of *Bothriocephalus latus*, seen from the side (magnified). C, The same seen from above (natural size). D, Head of *Tænia solium* (enlarged).

A cure can only be said to be radical when the head is found in the evacuations, or, if more than one worm exist, the head of each.

Occasionally the whole worm is expelled in one piece, as a densely coiled mass, and the head will be found by tracing the segments, from larger to smaller, until at last we find the smallest segments terminating in the slender neck and broader head of the worm. More frequently we find the smaller segments broken, and then the evacuation must be washed several times with water, by pouring clean water upon it again and again, allowing it to stand each time for ten minutes, and then pouring it off till it is scarcely coloured. Then we should transfer the worm, coil by coil, to a vessel of clean water, and search for the head amongst the residuum of single segments and smaller

fragments. If the head is not seen, it is to be feared it remains, not dislodged, in the small intestine. We must then wait for three months (the worm requires eight to ten weeks to arrive at maturity), and see if any fresh segments are expelled. If no segments have been expelled, we may conclude that the head was discharged, although not found, and that the cure is complete.

After taking a vermicide and vermifuge dose, it is a good plan to direct the patient to pass his evacuations into a vessel three parts full of warm water; this will greatly facilitate the search for the head of the worm. It is stated that if the expelled portion of the tapeworm comes in contact with any cold object, it may contract with sufficient vigour to break itself asunder, and leave part unexpelled.

Before administering the remedy by which we hope to procure the expulsion of the worm, some **preparatory treatment** is advisable in order to give the remedy the best chance of success. It is obviously desirable to clear away from the intestine, as much as possible, all the solid fæculent matter that may be present there, so that the remedial agent shall come in contact with the worm, diluted only with the fluid secretions of the intestine. We may also hope that the worm when detached will thus be expelled more quickly, and as we should have only fluid evacuations to examine, we should have less difficulty in discovering the head in them than in a mixture of solid and fluid excrement. We should therefore administer gentle laxatives for two or three days as a preparatory measure; not strong purgatives, which break the worm, and cause portions of it to come away, so that what remains may be more difficult to dislodge. Objection has been raised to the use of castor oil as a purgative in connection with Filix mas, on account of the solubility in oil of its active principle. Danger, in our opinion, need not be apprehended, except with excessive doses of Filix mas.

We may give from 1 to 2 drams of sodium

sulphate with 1 or 2 drams of syrup of senna in $1\frac{1}{2}$ ounces of cinnamon water each morning fasting, and an enema of soap and water each night. The food during these two or three days should be mostly fluid and concentrated, not leaving much undigested residue, such as the lean of meat, meat broths and soups, with bread crumb, fruit jellies, milk diluted with water, tea, coffee, wine and water, or mild beer.

The patient's bowels having been completely evacuated the evening or day before, and no solid food taken afterwards, on or soon after waking the next morning the vermicide medicine should be given. The following are the drugs that have been found most successful in getting rid of tæniæ:—

Male fern (Filix mas); *Kousso, or Cusso* (the dried panicles of Brayera anthelmintica); *Pomegranate* (the dried bark of the root of Punica granatum); *Pelletierine* sulphate and tannate (an alkaloid obtained from pomegranate); *Kamala; Turpentine; Pumpkin seeds* (the seeds of Cucurbita pepo); *Thymol.*

The **Filix mas**, or male fern, is an efficient tæniacide. It has been said to be more poisonous to the bothriocephalus than to the tæniæ. The liquid extract is generally used, and it is important that it should be as freshly made, from the fresh root, as possible.

It may be given in capsules, each containing 15 minims. A capsule should be given every quarter of an hour until four to six have been taken. They may be washed down with a little *café au lait;* or the extract may be made into an emulsion by rubbing down 60 to 90 minims with half a dram of compound tragacanth powder, and slowly adding 2 ounces of peppermint water. One-third of this draught should be taken every quarter of an hour.

Or the liquid extract may be made into a confection by rubbing up 60 to 90 minims with 4 drams of powdered male fern root, and a sufficient quantity of honey. A sixth part should be taken every quarter of an hour.

If, after two hours, no aperient action has followed these doses, a purgative should be given—a tablespoonful of castor oil is the best, which may be repeated in half an hour if necessary. A smaller dose of the male fern extract may be given to children, but we believe that when it fails to bring away the whole of the worm it is often because an insufficient dose has been given.

Some prefer to combine an aperient with the oil of male fern, and for this purpose capsules are made, each containing 7½ minims of extract of male fern and a grain of calomel. Sixteen of these are taken for a dose, two every ten minutes.

Bamberger * is reported to order the large dose of 5 drams of the fresh ethereal extract, with an equal quantity of castor oil, at one dose!

Kousso, or Cusso, an ancient Abyssinian remedy, has been warmly advocated by Heller, and it is, no doubt, an efficacious vermicide. An infusion may be made of the flowers, in coarse powder, 2 to 4 drams in 4 ounces of hot water, allowed to stand for fifteen minutes; but the compressed drug enclosed in gelatin capsules is said to act better. If the infusion is used it should not be strained from the herb, but the whole should be swallowed. It should be followed in less than two hours by a purgative. It is a very unpleasant drug to take, and not infrequently causes nausea and vomiting; it is also costly, hence it is not largely used in England.

Heller states that 5 drams are needed for expelling the *Tænia solium* and 7½ drams for the *Tænia saginata.*

Prof. Widerhofer † makes an electuary by mixing 2½ drams of powdered kousso with 6 drams of honey, and gives this in two doses; and Bamberger occasionally combines kousso with male fern, mixing 75 minims of extract of male fern with 2½ drams

* "Formulaire de la Faculté de Médecine de Vienne," by Dr. T. Wiethe, 1888, p. 91. † *Ibid.*

of powdered kousso, enclosing this in 30 capsules, and giving four every quarter of an hour.

Koussin, an alcoholic extract from kousso, has been found successful in doses of 30 grains, and it has the advantage of not exciting nausea.

Pomegranate.—The bark of the root of *Punica granatum* has been highly extolled by Küchenmeister. He directs that 3 ounces of the fresh bark should be macerated in 12 ounces of water for twelve hours, and the infusion concentrated to one-half. It must be taken within an hour in three or four doses, and if no purgative effect follows in an hour or two a dose of castor oil must be given. There is a decoction in the B.P., the dose of which is $\frac{1}{2}$ to 2 ounces.

It has been objected to this drug that it causes much abdominal discomfort, together with nausea and vomiting, and of late years an alkaloid derived from the bark of the pomegranate root—the **tannate of pelletierine**—has been used in its stead. This is a yellowish-white powder, insoluble, or almost so, in water, and is on that account better suited for a vermicide than the sulphate, which is soluble in water, and therefore more likely to be partly absorbed in the stomach. The dose is 5 to 8 grains, given fasting, mixed with a little water. A tumblerful of water should be drunk ten minutes afterwards, and half an hour later an aperient should be given—either a tablespoonful or two of castor oil or 1 or 2 ounces of infusion of senna. This has proved a most efficacious poison to the tapeworm; but it is questionable whether it may not produce toxic effects in children.

Turpentine has been found an efficient remedy for tapeworm. It must be given in a large dose, and is best combined with an equal quantity of castor oil so as to ensure its being carried quickly through the bowel, and not absorbed into the circulation, in which case it would be likely to give rise to troublesome renal irritation.

The mixture usually ordered consists of 1 ounce of oil of turpentine and 1 ounce of castor oil made into an emulsion with yolk of egg; but this is very disagreeable to take, and if we select turpentine as a tæniacide it is best to get an ounce each of turpentine and castor oil mixed and enclosed in about 30 gelatin capsules. These may be swallowed one after the other in a few minutes, the patient washing them down with mouthfuls of warm milk and water. If this dose be taken fasting it will usually act quickly as a purge, and bring away the dead worm.

Kamala.—This is an orange-red powder, probably of a resinous nature, and consisting of the glands and hairs from the capsules of a euphorbiaceous plant. It is quite insoluble in water. It should be administered in doses of 30 to 100 grains, according to the age and vigour of the patient, and usually two doses are given at an interval of half an hour. It may be made into a confection with honey, or it may be suspended in gruel or chocolate. An aperient should be given within two hours. It is usually efficacious in expelling the worm.

Davaine prefers the **tincture** made by macerating 1 part of kamala with 2 of rectified spirit for two days, and filtering. (The B.P. tincture is 1 in 5.) A dram of this with a dram of syrup of orange-peel and an ounce of cinnamon water should be given every hour for four doses, and if the worm is not expelled within two hours of the last dose an ounce of castor oil should be given.

Pumpkin seeds have been found a mild and useful tæniacide for children, and not unpleasant to take. Their efficacy appears to depend on the presence of a resin in the perisperm, to which the name *peporesine* has been given. About an ounce of the seeds may be given a child for a dose, and they may be pounded up with sugar and honey into a paste, which children will readily eat.

Thymol.—This drug has recently been stated to be efficacious in the destruction of tapeworm.

The advantage is claimed for it over most of the other remedies that it does not cause any gastric or intestinal disturbance; that it both kills and expels the worm; that, compared with other remedies, its administration is rapid and simple. It is admitted, however, that, given in doses sufficient for the purpose in view, it produces a certain amount of depression, the pulse becomes more frequent and more feeble, the respirations and the temperature are lowered; it is, therefore, necessary to accompany its administration with some stimulant such as strong coffee.

Dr. Numa Campi has given it in the following manner: In the morning an ounce of castor oil, and then during the day 10 grains of thymol every quarter of an hour, and twenty minutes after the last dose again an ounce of castor oil. A few minutes afterwards a *Tænia mediocanellata* was expelled entire. We are disposed to consider these doses large, and we should prefer in trying this drug, which is somewhat caustic, to give not more than 3 to 5 grains for a dose, and we should make this into pills with a little powdered soap and spirit. Two pills, with 2½ grains in each, might be given every twenty minutes, with a wineglassful of warm milk and water. The patient should, of course, take nothing in the way of food during the time he is taking the thymol. Other antiseptic substances have been used to kill tænia, and, it is stated, with success—e.g. naphthaline, in doses varying from 2 to 20 grains, mixed with powdered sugar, twice a day; and creolin, 15 grains in a capsule three times a day.

The following has been stated to be an efficacious tæniafuge :—

℞ Olei crotonis ... ... gutta j.
Chloroformi ... ... ℥j.
Glycerini ... ... ℥x.

Misce, fiat mistura. Half to be taken fasting, and repeated in half an hour. Abstinence from food the evening before.

Chloroform in 15- or 20-minim doses, mixed with simple syrup, has also been said to prove efficacious in

getting rid of tapeworm. A dose is given every two hours, and subsequently a dose of castor oil. If it escaped complete volatilisation in the stomach and reached the small intestine, it might intoxicate the worm, and so detach the head.

It must be borne in mind, in administering drugs for tapeworm, that the object is to poison and kill or paralyse the worm, so that it may relax its hold on the intestinal walls, without poisoning the patient; and those remedies, therefore, which are insoluble or very slightly soluble in water are the most suitable.

Infusions and decoctions which may be largely absorbed in the stomach are objectionable, for two reasons—first, the absorbed substances may produce disagreeable toxic effects on the patient; and, second, if a portion is absorbed in the stomach it fails to reach the worm in the small intestine. Hence we see nearly all the successful tæniacides are either oils, or resins, or oleo-resins.

The **prophylaxis** consists in scrupulous cleanliness and care in the preparation of food, which should be completely cooked, raw and underdone meats being avoided. And in association with domestic animals great care should be observed.

Roundworms

Ascaris lumbricoides. — The *lumbricus*, or roundworm, inhabits the small intestine, but wanders sometimes to other parts. It is cylindrical, usually of a light-brownish or dirty-white colour, and tapers at each end. The female averages from 6 to 12 inches in length, the male is smaller. Five or six are often found together, and occasionally a much larger number. The mature female produces an enormous number of eggs, which are discharged in the evacuations. These eggs have great power of resisting destructive agencies, and probably retain for years the capacity of development. We have no certain knowledge of the complete life history of this parasitic worm, or how man becomes infected; but it seems

most likely that the eggs gain entrance to the human intestine in contaminated drinking water. It is much more common amongst the poor and uncivilised than amongst the better and more civilised classes, who are trained to habits of cleanliness, and whose food is more carefullyse lected and prepared. It is also far more common in children than in adults.

The presence of these worms in the intestine is usually discovered by the appearance of one in the motions, or they may wander into the stomach and be vomited, or occasionally they have appeared at the nostrils. Children are, however, often suspected of having worms when they present certain symptoms that are otherwise difficult to account for, such as itching at the nose, capricious appetite, foul breath, colicky pains, with swelling of the abdomen, emaciation, nocturnal restlessness, bad dreams, and grating of the teeth in sleep. Convulsions and epilepsy have been occasionally caused by them.

The **treatment** of these worms is simple. The best vermicide for them is *santonica*, the unexpanded flower-heads of *Artemisia maritima*, or its active principle, **santonin.** It kills them speedily and certainly. The drug must, however, be used with great caution in very young children and infants, as it has been known to cause toxic symptoms which have even proved fatal, viz. purging and vomiting, with convulsions and coma. Santonin is very sparingly soluble in water, and is often given in lozenges (B.P.), each containing 1 grain. The dose is 2 to 3 grains given fasting or after a mild purge, and in combination with some aperient such as castor oil. Professor Heller objects to castor oil as a medium for the drug, as, he says, it has the property of dissolving santonin, and, therefore, promoting its absorption and the production of toxic effects. Küchenmeister, however, maintains that it acts better when given with castor oil than in any other way; and Professor Whitla confirms this observation, "after seeing its administration in some thousands of instances in the

practice of a children's hospital. Unpleasant symptoms were never observed, though the drug was given in full doses; *the oil appears* to lessen very considerably the risk of any evil effects." He gave 2-grain doses to children 2 years old, at bedtime, mixed with a large teaspoonful of castor oil, and more oil in the morning if necessary. If castor oil is objected to, the drug can be given mixed with 2 or 3 grains of calomel and a little powdered sugar. Or lozenges may be made, each containing 1 grain of calomel and 1 grain of santonin, two or three of which would be a dose. For older children from 5 to 10 years of age the following mixture may be prescribed:—

℞ Santonini ... ... gr. vj.
Olei ricini ... ... ʒiv.
Syrupi aurantii ... ... ʒiij.
Mucilaginis acaciæ ... ... ʒvj.
Aquæ carui ... ... ad ʒiij.
Misce, fiat mistura. Take half in the morning fasting.

One of the bye-effects of santonin, coming on shortly after the dose is given, is yellow vision, and the urine is often stained yellow or orange. **Kamala** also is efficacious in the cure of lumbrici; and so is **thymol.**

Dr. H. H. Hare says:* "The careful physician will also see that the patient receives, immediately after the action of the purgative medicine, a copious rectal injection of salt water, in order that the bowel may be thoroughly washed out, and in this liquid, when it is expelled from the bowel, there will be found quite frequently additional worms to those freely passed. . . . The head of a tapeworm will perhaps be washed out of the bowel by this means."

Oxyuris vermicularis, or **threadworm.**—This is a small, white, round worm, tapering at each end. The female, which is longer than the male, is about $\frac{2}{5}$ inch long, the male being only a third or half that length. The posterior extremity of the

* Hare's "System of Practical Therapeutics" (2nd edit.) vol. ii., p. 491.

female is drawn out into a fine-pointed tail, that of the male is blunt and curved upward.

This worm, from the egg to maturity, spends its whole life in the human intestine. It is only found there from the jejunum to the anus. It is an error to suppose, as has often been stated, that this worm specially inhabits the rectum. The young animals and the mature males chiefly inhabit the small intestine; the impregnated and mature females the cæcum. In the cæcum they are most abundant, and the females gradually collect together there until mature and crammed with eggs. They are prone to collect in the vermiform appendix. Heller has seen with the naked eye as many as nineteen females and nineteen males in the appendix. They then pass slowly down the large intestine, and finally deposit the chief part of their eggs in the rectum. They sometimes even crawl out on to the moist skin around the anus. Finally, both males and females are mechanically expelled with the fæces, and perish. It is generally believed that the ripe eggs must be swallowed, and their shells acted upon by the gastric juice of the stomach, in order that the embryo may be set free so as to affect the human intestine. But certainly one observer has seen the embryos escaping from the eggs in mucus taken from the rectum.* But this is regarded as a very exceptional circumstance, and in general the embryos are first set free in the stomach, and at once pass into the upper part of the small intestine. They arrive quickly at maturity. Young worms have been expelled fourteen days after swallowing the eggs. They are often excessively numerous, covering the whole mucous membrane of the intestine.

As to the **cause** of the presence of this worm in the intestine, it must be concluded that the ripe eggs are always swallowed, and that it is a consequence of want of care and cleanliness. Scrupulous cleanli-

* Vix, quoted in von Ziemssen's Cyclopædia, vol. xii., p. 755.

ness is needed to prevent self-infection. As the eggs soon perish in water, it is not likely that they are introduced in drinking water, but it has been suggested that, under favourable conditions, they may be transmitted in the dust of the atmosphere. They occur at all ages, but are more common during childhood.

The particular and characteristic symptom this worm gives rise to is irritation of the lower part of the rectum just within the sphincter. The worms descend to this part to lay their eggs, and their active boring movements cause an intense and almost intolerable tickling and itching. This is especially noticed at night in bed. In females, the worms that have escaped from the rectum may creep between the vulva and into the vagina, or may be carried there by the hands in scratching, and there by their wriggling, boring movements they set up great irritation of the sexual organs, and may lead to masturbation. By exciting sympathetic irritation of the generative organs they have been known to cause troublesome erections, nymphomania, pruritus, etc.

The successful **treatment** and complete dislodgment of this parasite is often difficult; for not only have the gravid females to be dislodged from the rectum, which is not very difficult, but the young pinworms have to be destroyed in their favourite abiding place, the cæcum, and in the appendix vermiformis.

To dislodge them from the rectum the best plan is to administer, daily, an injection which shall wash away the worms and their eggs, together with the mucus in which they are embedded. Various substances have been recommended to be used for these enemata—as decoction of quassia (made by boiling an ounce of quassia chips in a pint and a half of water down to a pint and straining—an effectual remedy); decoction of eucalyptus; lime water; salt and water (two teaspoonfuls to a pint of water, improved by the addition of half a teaspoonful of bicarbonate of soda); natural sulphur

water; glycerine and water (equal parts). Heller prefers an enema of soap and water, 2 or 3 grains of Castile soap to each ounce of distilled or rain water. This is without any unpleasant action on the intestinal mucous membrane, while it quickly destroys both worms and eggs. He recommends the adoption of Hegar's method of washing out the whole length of the large intestine by means of a long flexible tube and a siphon arrangement, the patient being placed on his hands and knees. After the bowel has been freed from fæces, in the adult (for whom alone this treatment is practicable) the bowel may be washed out with large quantities of soap and water—as much as can be tolerated without exciting persistent straining efforts—from 3 to 6 pints, introduced slowly. This method is only necessary in very troublesome cases.

Excellent results have been said to be obtained by enemata of naphthaline (15 to 20 grains) in olive oil (1½ to 2 ounces) in young children. Larger doses must be employed for adults, and in this case a turpentine enema, 1 dram to a pint of soap and water, is very useful.

Injections of cod-liver oil, pure, or made into an emulsion with yolk of egg, have also been found useful, and they have the advantage of being non-irritating.

The introduction into the rectum of mercurial ointment, diluted with vaseline, which can be passed in with the finger or on a small piece of sponge, or a **mercurial suppository,** is a good plan in cases where the employment of enemata is difficult. The white precipitate ointment should also be applied freely to the external parts to destroy ova or wandering parasites. If there is much local irritation still unrelieved, the anus and the mucous membrane just inside it may be brushed with a 4 per cent. solution of hydrochloride of cocaine.

Dr. Archambault, when he finds enemata of 4 to 6 ounces of lime water fail, uses solutions of per-

chloride of iron (5 per cent.) every night for five to ten nights, or a small lavement (3 ounces) containing ¼ grain of corrosive sublimate.

With regard to internal remedies for evacuation of the young worms in the upper bowel, the free administration of **purgatives** is very useful; they mechanically sweep away the parasites. In adults we may give a combination of the sulphates of magnesia and soda, a teaspoonful of each dissolved in a tumblerful of cold water, early in the morning, repeating the dose every hour until free purgation is established. In children a combination of calomel, jalap, and scammony answers well, such as the following, given at bedtime or in the early morning :—

℞ Hydrargyri subchloridi, gr. ij.
Pulveris scammonii compositi, gr. x. ad gr. xx.
(according to age).

Or 2 grains of calomel may be given, with 10 to 30 grains of confection of scammony, at the same hour.

Or the effect of **sulphur** may be tried as an aperient, and this, being insoluble, will certainly come in contact with the worms in the cæcum. Half or a whole teaspoonful of the confection of sulphur should be given every night, and an ounce of the compound senna mixture (B.P.) the following morning. In obstinate cases we have derived benefit from keratin-coated capsules of **cyllin** (3 minims each), given three times a day to adults, after the purgative. Others have used **thymol** and **naphthaline** in similar circumstances.

Dr. Sidney Martin has had good results from the use of **rhubarb** in small doses, and the worms have been so freely expelled that there has been no need of injections. He gives the following dose three or four times a day :—

℞ Tincturæ rhei ... ... ♏iij.
Magnesii carbonatis ... ... gr. iij.
Tincturæ zingiberis ... ... ♏j.
Aquæ ... ... ad ℥j.
Misce, fiat dosis.

The regular use of **tonics** of vegetable bitters and iron will further this result, and so will the use of cod-liver oil in thin and strumous children. Twenty or 30 minims of the syrup of the phosphate of iron in two teaspoonfuls of infusion of calumba may be given to children one hour after food three times a day, or half a teaspoonful of vinum ferri citratis to quite young infants, or a grain or two of reduced iron in a powder with sugar.

In adults we have found the continued use of the following pill useful in preventing the reappearance of the parasite :—

℞ Ferri sulphatis exsiccati ... ... gr. j.
Quassiæ pulveris ... ... gr. ij.
Saponis ... ... gr. j.

Misce, fiat pilula. Two or three to be taken thrice daily an hour after food.

The ordinary vermicides seem to have little effect on these parasites, partly because some of these are absorbed before they reach the cæcum, and partly because these worms seem to be able to resist the action of such agents. Heller states that he has found them quite lively under a dressing, applied for venereal disease, consisting of a fairly strong solution of carbolic acid.

The prophylactic measures are too obvious to need mention.

The **Trichocephalus dispar,** or long thread-worm, which also is found inhabiting the cæcum of man, is rarely seen in England. It is attended by no special symptoms, and is not amenable to any particular treatment.

The **Ankylostomum duodenale,** which is very prevalent in Egypt and in most tropical countries, is little known in the north of Europe. The symptoms of its presence may be multifarious, but languor, profound anæmia, and every degree and kind of malnutrition are among the most frequent manifestations.

The efficient measures of **prophylaxis** are tersely expressed in two recommendations of the Porto Rico Commission :

1. Have a privy in your house. Do not defæcate on the surface of the ground, but in the privy.

2. Do not walk barefooted, so that you may avoid contracting the disease in your feet. Wear shoes and you will never suffer from anæmia.

The parasites enter the body most frequently through the feet and hands.

Federici stated that *thymol* acted successfully in killing the parasites in some cases which occurred among the miners of the St. Gothard Tunnel ; its use is also recommended by Manson. As much as 30 grains has been given in a cachet early in the morning, and repeated after two hours, followed in another two hours by a purge.

Dr. MacDonald, of Colombo, we are informed, treats this disease by giving 30 grains of thymol, with 30 grains of sugar, in the early morning, having given a senna purge the night before ; eighteen hours afterwards a dose of castor oil is given. This treatment is repeated after four to eight days.

Phillips gives the following as the routine treatment of ankylostomiasis at the Kasr-el-Ainy Hospital: At 6 p.m. the patient is given a purge, to be followed by a night of fasting. At 7 a.m. he takes half the following mixture, and in half an hour's time the other half :—

Eucalyptus oil	... 2·50 grammes.
Chloroform	... 3·50 grammes.
Castor oil...	... 40 grammes.

He remains in bed fasting till the bowels act. The dose can be repeated, if necessary, every other day. In the young and feeble the dose is divided into thirds, and given at intervals of twenty minutes. The worms are expelled alive, and the stools must be examined for their presence, so as to know when to repeat or to cease treatment.

ADDITIONAL FORMULÆ

For tapeworm

℞ Radicis granati, ℥jss ad ℥ijss
Macerate for twenty-four hours, then boil in—
Aquæ destillatæ, ℥xij.
Evaporate to 6 oz. and add—
Extracti filicis maris æther., ℥ij.

A third part to be taken (fasting) every half-hour. Take a saline aperient the night before, and no food other than soup or tea, or a salt herring! (*Bamberger.*)

Another

℞ Kousso pulveris, ℥v.

Infuse in boiling water (half a pint) for a quarter of an hour, strain, and add half a teaspoonful of lemon juice. To be taken fasting. (*Bamberger.*)

It will be necessary to give one or two tablespoonfuls of castor oil if the vermicide does not act as an aperient.

Another

℞ Extracti filicis maris æther., gr. xxx.
Pulveris radicis filicis maris, gr. xxx.
Confectionis rosæ, quantum sufficiat
Ut f. pil. x. From two to four pills every half-hour. (*Bamberger.*)

For children

℞ Kousso pulveris, ℥ij.
Extracti filicis maris æther., ℥j.

Enclose in twenty-four gelatin capsules. Four to be taken every quarter of an hour. (*Bamberger.*)

Draught for tapeworm

℞ Extracti filicis liquidi, ℥j.
Ovi vitellum, ℥j.
Aquæ chloroformi et syrupi simplicis, q.s. ad ℥ij.

M. f. haust. To be taken in the morning. (*Whitla.*)

Black oxide of copper for tapeworm

Black oxide of copper, gr. xc.
Prepared chalk, gr. xxx.
Kaolin, gr. clxxx.
Glycerine, q.s.

M., divide into 120 pills. Two to be taken four times a day for a week, and three four times a day for a second week. Then a good dose of castor oil. (Acids must be avoided during this treatment.) Strongly advocated by Sass.

Confection for children

℞ Pulveris kamalæ, ℥v.
Extracti filicis maris æther., ℥ijss.
Syrupi aurantii } āā q.s.
Pulveris acaciæ }
Ut f. electuarium. To be given in cachets. (*Monti.*)

Pills for children

℞ Extracti radicis granati recentis, gr. xl.
Extracti filicis maris, gr. xl.
Pulveris radicis granati, gr. viij.

Ut f. pil. xl. Half an hour after giving the child a cup of milk, give ten of these pills every half-hour, keeping ten in reserve in case some of the others should be vomited. A few hours afterwards a dose of castor oil. (*Fleischmann.*)

For lumbrici

℞ Santonini, gr. viij.
Extracti spigeliæ fluidi, ʒvj.
Extracti sennæ fluidi, ʒij.
M. A teaspoonful for a dose for a child of 5 years.
(*Prof. Lewis Smith.*)

Enema for ascarides

℞ Aloes barbadensis, ʒss.
Potassii carbonatis, gr. xv.
Decocti amyli, ℥x.
M. f. enema. (*Guichon.*)

Powder for lumbrici

℞ Santonini, gr. jss.
Hydrargyri subchloridi, gr. ij.
Sacchari lactis, gr. xv.
M. f. pulv. To be given in honey to an infant 2 years old.

Enema for ascarides

℞ Liquoris calcis, ℥iv.
Decocti althææ, ℥j.
M. f. enema. (*Barthez.*)

Another

℞ Ol. cajuputi, ♏xx.
Magnesiæ levis, gr. x.
Mucilaginis amyli, ℥iv.
M. f. enema.

Jelly for children

℞ Extracti filicis maris liquidi, ʒj.
Hydrargyri subchloridi, gr. vj.
Sacchari albi, ʒij.
Gelatin, q.s.
Ut f. electuarium. Quarter of this may be given every half-hour. (*Duchesne.*)

CHAPTER XIV

TREATMENT OF DISEASES OF THE INTESTINES: PERITONITIS

ACUTE GENERAL PERITONITIS: Usually Secondary to Traumatic Lesions or Visceral Diseases—Sometimes Local and Partial—Symptoms of Acute General Peritonitis—*Treatment*—Surgical Co-operation—Avoidance of Delay—Relief of Suffering—Opium to be avoided—Salient Features of Modern Surgical Treatment—Indications for After-treatment—Stimulants—Warmth—Food—Vomiting—Thirst—Saline Solution—Purgatives—Turpentine Enema—Turpentine Stupes—Rectal Tube—Water—Calomel—*Surgical* Treatment.

TUBERCULAR PERITONITIS: Tabes Mesenterica—Latency and Obscurity of Peritoneal Tubercle—Symptoms—Ascites—Sacculated Exudation—*Treatment*—Local Applications—Cod-liver Oil and Iodoform—Spontaneous Cure—Mercury—Laparotomy, when advisable.

Additional Formulæ.

ACUTE peritonitis is most commonly met with as a consequence of some other disease or injury. Wounds and contusions of the abdomen, accidental or surgical, may give rise either to partial or general peritonitis. The most common cause, however, of peritonitis, and especially of general peritonitis, is some disease of the abdominal viscera, such as simple perforating ulcer of the stomach or duodenum; tubercular, typhoid, dysenteric, or cancerous ulceration of the intestine; disease (abscess, ulceration, etc.) of the vermiform appendix or cæcum; intestinal obstruction; diseases of the liver, such as abscess of liver or cysts, or acute hepatitis; ulceration and perforation of the gall-bladder or bile ducts; diseases of the pelvic viscera, as inflammation of the uterus (puerperal fever), Fallopian tubes or ovaries, or disease of the bladder. In all these cases the peritonitis must be regarded as septic, and depending on the passage of micro-organisms into the peritoneal cavity.

Acute peritonitis also occurs in connection with

certain general diseases, as in Bright's disease, in septicæmia, in pneumonia, and in some exanthemata. When it accompanies lesions of the abdominal and pelvic viscera it is often local, and limited to the vicinity of the visceral disease causing it; the same is also frequently the case when it is due to external injuries and surgical operations; but when it is caused by perforation of the stomach or any of the hollow viscera, and their contents escape into the peritoneal cavity, it is usually severe and general.

Tubercular peritonitis is a special form of peritonitis which will be considered apart.

The characteristic **symptoms** of acute diffuse peritonitis are these: very severe abdominal pain and tenderness, often accompanied with grave collapse. The pain is so severe that the patient dreads the slightest touch or movement, and therefore lies on his back with his knees drawn up so as to relax the abdominal walls as much as possible and keep off the pressure of the bed-clothes. There is abdominal distension and tympanites, believed to be due to the inflammation involving the external coat of the bowel, or at any rate leading to such a disturbance of innervation of the muscular coat that a subparalytic condition of the intestinal walls is produced, so that they become greatly dilated; hence the tympanites. Hence also another symptom that almost invariably attends acute diffuse peritonitis (unless it should happen to have supervened on some other affection which has been attended with diarrhœa), and that is absolute constipation. Owing to the great pain attending any movement of the intestines or abdominal wall, and owing also to the pressure on its lower surface of the distended intestines, the diaphragm moves but little in respiration; the inspirations are therefore very shallow, and the respirations are greatly quickened and wholly, or almost wholly thoracic.

The digestive functions are practically suppressed. There is entire loss of appetite; the tongue and mouth are red and dry; there are thirst, nausea

and vomiting, and the matters vomited have often a green colour. The countenance is usually pale, the features are pinched, and the expression anxious. The pulse is small, hard, and rapid, of the kind that is termed wiry. The skin is dry and hot, and the temperature raised often to 104° F., or even 105°. The urine is high-coloured and scanty, and passed with pain and difficulty. If much serous effusion should occur later on, percussion will disclose some dullness in the flanks.

In the gravest cases, viz. those due to perforation of the stomach or intestines, there is usually marked collapse, and, in the great majority of cases, a rapidly fatal issue.

When the exciting cause has not been of such extreme gravity the symptoms may subside, and the patient recover. Adhesions between coils of intestine, or between the walls of the intestine and the abdominal walls, are apt to be left behind, and habitual constipation may thus originate.

We may now proceed to consider the **treatment** of acute peritonitis.

It is sometimes said that there is no medical treatment of acute general peritonitis, and we accept this dictum to the extent of allowing that no physician is justified in conducting the treatment of a case without the active co-operation of a surgical colleague. But so important are the medical details of treatment following upon operation, that it would be almost as legitimate to reverse the dictum, and to say that there is no surgical treatment of acute peritonitis. In a work of this nature we shall necessarily confine our attention chiefly to such non-operative details of treatment as are of peculiar interest to the general practitioner. When summoned to such a case, and when the opinion is formed that acute peritonitis is present, he should waste no time on the attempt to identify the immediate exciting cause. Delay at this stage is probably responsible for more loss of life than all

other errors of treatment combined. He must at once come to a decision, based on the general condition of the patient, as to whether operation is permissible or not. If the decision be in favour of operation, the most skilled surgical assistance available should be obtained at once. If, on the other hand, the state of the patient is such as to preclude any hope of relief from operative interference, the sole duty that remains is to relieve suffering and distress by the free use of narcotics during the short period that separates the patient from death.

If the die is cast in favour of operation, the medical man should do all in his power by legitimate means to diminish the sufferings of the patient, until surgical assistance is at hand.

It is scarcely necessary to say that the patient must be kept absolutely at rest; indeed, all movement is so painful that he will rarely show any indisposition to obey this injunction. Treves calls attention to the natural tendency of patients with acute peritonitis to hold the hands above the head—a posture which, by acting on the lower part of the thoracic wall, assists in diminishing the tension within the abdomen —and he points out that "it is cruel to insist that the hands shall be kept beneath the bedclothes," as some nurses may be prone to do. A cradle may be arranged over the body to keep off the weight of the bed-clothes.

Hot fomentations may be applied to the abdomen, if the patient can bear them, and should be frequently renewed; if necessary, they may be sprinkled with belladonna liniment. There is now a consensus of opinion against the employment of *opium* at this stage. It is apt to produce such an immediate appearance of relief that the whole aspect of the symptoms is altered, and the surgeon is brought face to face with a case in which the symptoms have subsided, and on this evidence is asked to undertake an operation of extreme gravity. But there are other objections to the use of opium as

well. It has been shown to inhibit the activity of the leucocytes, and this should on no account be allowed at a time when the life of the patient depends largely on the highest working capacity of his defensive mechanism. Further, as we have already seen, opium in effective doses diminishes the tonicity of the intestinal muscle, and so helps to aggravate the paralytic distension which is one of the most serious complications of acute peritonitis.

While awaiting operation, the administration of saline solution, either by rectum or by subcutaneous injection, will assist the patient to withstand the shock of operation. We shall subsequently consider other matters pertaining to the employment of saline solution in acute peritonitis.

The salient points in the modern surgery of acute peritonitis have been succinctly formulated by Mayo Robson,* as follows :—

(1) The removal or repair of the cause, with or without irrigation of the peritoneal cavity; (2) drainage of the site of operation by a split rubber tube containing a strip of gauze, and of the peritoneal cavity by a tube in the pelvis, assisted by the reclining posture, which he has for years advocated after all abdominal operations; (3) rapidity of operation; (4) avoidance of unnecessary exposure and handling of the viscera; (5) the prevention of shock; (6) the free administration of saline fluid by the rectum; (7) rectal alimentation and the stoppage for a time of mouth feeding; and (8) the avoidance of opium and sometimes the administration of repeated small doses of calomel subsequently to operation.

For the technique of the various operative details we must refer our readers to the modern textbooks of practical surgery.

What are the essential indications for the **after-treatment?**

1. To combat shock and support the strength.

* *Lancet*, Dec. 29, 1906.

2. To aid in the elimination of toxic substances.
3. To check intestinal movements.
4. To prevent intestinal distension.

1. If there is any place for the use of opium in the treatment of acute peritonitis, it is to relieve the restlessness and distress that so frequently harass the patient after a severe abdominal operation. Then we may appropriately give a single subcutaneous injection of $\frac{1}{4}$ grain of morphia combined with $\frac{1}{120}$ grain of atropine. Care should be taken to maintain the temperature of the body. Hot-water bottles should be applied to the body and legs. Mayo Robson advises the wearing of a loose suit of Gamgee tissue until all shock is over. Strychnine may also be given, $\frac{1}{30}$ grain subcutaneously every three or four hours, with occasional $\frac{1}{2}$-dram injections of camphor dissolved in sterilised oil (1 in 6).

Food should be administered by means of nutrient enemata. At first liquid peptonoids may be given in the saline injections administered per rectum, and brandy and whisky, if called for, in the same manner. When there is no longer any need of saline injections, we may have recourse to any of the formulæ enumerated in the section on Rectal Feeding (p. 42). Attempts have been made to supplement feeding per rectum with the subcutaneous administration of a 5 per cent. glucose solution. These injections, however, are apt to excite not a little local pain, and we consider such supplementary feeding quite unnecessary for the few days, at most, for which artificial feeding must be maintained.

Vomiting is apt to be a troublesome symptom, and must be checked if it is seriously exhausting the patient. In so far as it serves to evacuate from the stomach material which, when it reaches the intestine, may undergo fermentation or excite intestinal peristalsis, it is of service. If, however, it is exhausting from its persistence, it is best treated by lavage of the stomach with a weak alkaline solution. Hiccough calls for the same treatment.

Since the routine use of saline injections has become a matter of general acceptance, we have seen but little trouble from thirst, which formerly was one of the symptoms that most frequently called for relief. If any further measure is necessary, we may cleanse the mouth with a glycerine and lemon mixture, or with 5 or 6 drops of odol in an ounce or so of water. We object to the practice of sucking cracked ice, as it necessarily involves the entrance of fluid into the stomach at a time when it is imperative to check all peristaltic movements. Moreover, it by no means affords infallible relief, and at times accentuates the thirst it essays to relieve.

2. By means of the copious administration of normal saline solution we are able to reinforce operative measures in eliminating toxic substances from the blood by increased activity of urinary and biliary secretion. So long as severely toxic symptoms persist the only practical limit to the amount we may employ is the tolerance of the patient: as much as 5 litres has been given in twenty-four hours. We prefer, if practicable, to give the injections wholly into the bowel, but at times it will be necessary to give part at any rate into the loose subcutaneous tissues beneath the breast or in the axilla, or directly into a vein. We may commence with $\frac{3}{4}$–1 pint every hour or two until four or five pints have been given, and then after an interval of a few hours the same procedure may be repeated. We consider that it is wiser to entrust the injections to a skilled nurse than to rely on any method of continuous irrigation of the bowel, or continuous infiltration of the subcutaneous cellular tissues. These saline injections serve also, as we have seen, to prevent thirst, and are some safeguard against the effects of shock by keeping the blood-vessels filled.

3. Just as formerly opium was freely employed to hinder peristaltic movements of the intestine, and so check the spread of the infective material from the focus of infection to other parts of the peritoneum,

we now aim at promoting the same end, but by other means. We depend for this mainly on withholding all food from the stomach. For the same reason too we have discarded the use of purgatives, which at one time was highly extolled, as a means of eliminating toxins from the system, until the cause of the peritonitis has been removed or repaired, and until signs of diffuse peritoneal inflammation have subsided.

4. In discussing the foregoing indications in the after-treatment of acute peritonitis, we have of necessity anticipated some of the means at our disposal for preventing tympanitic distension of the intestine. The withdrawal of food given by the mouth, and the subcutaneous administration of strychnine and of camphor, each subserve this purpose. For this end, as soon as circumstances already considered permit, we allow small doses of calomel, with a view to arresting decomposition in the intestine and aiding the expulsion of any stagnant flatus. Mayo Robson recommends $\frac{1}{8}$ grain every hour or two until a grain has been given, and after an interval the same dose may be repeated. Others use saline aperients in similar small doses, but we consider these inferior to calomel—certainly in any antiseptic effect.

Turpentine stupes or an enema of turpentine or of asafœtida, or the gentle passage of a hollow rectal tube, will sometimes prove of help in preventing or relieving meteorism.

Tubercular peritonitis is more frequently chronic or subacute than acute. It may, however, occur as a part of a general acute miliary tuberculosis, but that is not a condition with which we are now concerned.

The occurrence of tubercular peritonitis is usually associated with the presence of tubercle in other organs; as tubercle of the sexual organs, the uterus and Fallopian tubes in women, the testes in men; or tuberculous ulcers of the intestine; or tubercular deposits in the lungs or pleura. In children

it is often associated with intestinal tubercle and secondary tubercular affection of the mesenteric lymphatic glands, and it then presents that form of disease which is known as *tabes mesenterica.*

It would seem that tubercle of the peritoneum is in some cases primary, and more prone to undergo curative changes than tubercle in other organs. This fact has recently been established.*

The early symptoms of tubercular peritonitis are often very obscure; sometimes it comes on abruptly as a severely acute peritonitis, and then its nature is very likely to be misunderstood; one such case which came under our observation had been diagnosed as one of perforation of the bowel; and sometimes the disease is quite latent, and it has been discovered accidentally in operations for hernia or ovarian tumours. Shifting abdominal pains, with emaciation, and perhaps diarrhœa, loss of appetite, a moderate evening rise of temperature,† tenderness on pressure over the abdomen, the surface of which may feel hot as well as hard and resistant, are the symptoms that may be looked for. There may be retraction or there may be swelling of the abdominal cavity; and in the latter case the effusion of fluid may give rise to fluctuation. When this disease occurs in children it is much easier of detection than in adults. The tumid, tender belly, resonant in parts and dull in parts, with occasionally a lumpy feeling, the pinched face and wasted limbs, and general discomfort and fretfulness, together form a fairly characteristic picture. Moreover, in many the omentum is found to be curiously indurated and rolled-up, as it were, into a roundish or elongated tumour, stretching across the abdomen above the umbilicus. We may, of course, have at the same time evidence of the deposit of tubercle in other organs.

Ascites is common, but the exudation is often

* *See* Clinical Lecture by the author, *Lancet*, March 16, 1901.

† Subnormal temperatures have not infrequently been recorded.

sacculated, and has often been mistaken for an ovarian cyst.

The successful **treatment** of these cases of tubercular peritonitis, surgical or otherwise, must, of course, depend greatly on whether the disease is limited to the peritoneal cavity, or whether the peritoneal tubercle is only a part of a more widely spread tuberculosis. In some instances, however, successful laparotomy, for the cure of peritoneal tuberculosis, has seemed to exert an indirect favourable influence on a tubercular lesion in some other part of the body. A far more hopeful view is now taken of these cases than formerly prevailed.

The first essential in this, as in other forms of tuberculosis, is to place the patient in the most favourable surroundings, where he may have abundance of fresh air, and as much sunshine as may be. For children the seaside, and especially Margate, finds favour. Food should be abundant and nourishing: as much fresh cow's milk as possible should be taken with the food.

In a previous edition we recorded a rapid recovery from tubercular peritonitis, with much ascites, in a boy of 12; this was a chronic or subacute form, and the treatment consisted chiefly in painting iodine paint over the abdomen daily, or on alternate days, as it could be borne, and then smearing this with a layer of olive oil to prevent evaporation. At the same time the patient took $\frac{1}{2}$ grain of iodoform dissolved in a dessertspoonful of cod-liver oil, after food, three times a day. The improvement began early, and was steadily maintained. We have still more recently published the particulars of three consecutive cases in which cures followed a similar line of treatment. Iodoform was given internally in $\frac{1}{2}$-grain doses, and an ointment composed of equal parts of iodoform ointment and cod-liver oil was rubbed into the surface of the abdomen twice daily.* If preferred, the

* *See* Clinical Lecture on the "Treatment of Tuberculous Peritonitis," *Lancet*, March 16, 1901.

iodoform ointment may be diluted with olive oil or lanoline.

When iodine of potassium is given by the stomach, in a short time the presence of iodide can be detected in the saliva and in the urine. So when iodoform is rubbed into the skin of the abdomen in a young person it probably rapidly enters the blood and is, if regularly applied, continuously eliminated in the secretions, including the secretions into the serous cavities, and as these do not pass out of the body as the secretion of the kidneys does, they must, in course of time, become pretty richly charged with iodine compounds—at any rate sufficiently so to act as antitoxin to the tubercle toxin or as antibacterial to the bacilli. The first thing to be determined was whether the iodoform in the ointment, when rubbed into the abdominal surface, was absorbed into the blood quickly and eliminated by the secreting organs, such as the kidneys. Dr. Still was so good as to make this observation for us at the Children's Hospital in Great Ormond Street. He found, first, that iodoform ointment is excreted and easily recognisable in the urine as iodine or the salts of iodine; and, secondly, that the rate of excretion is very rapid. When half a dram was applied to the abdomen it was recognisable in the urine four hours later, and apparently, after a second application, it reappeared in the urine in two hours' time. When only 15 grains were applied in another case it was recognisable in the urine $15\frac{1}{2}$ hours after application. We have proof here of the rapidity with which iodoform is absorbed by the skin, enters the blood, and circulates as an iodine compound through the tissues of the body and is eliminated into the secretions.

Now, it is an interesting circumstance in this connection that the idea that iodine is an antitoxin to tubercle had long been in the minds of physicians. We use the word "antitoxin" in a wide and general sense.

Two Italian physicians* have recorded a case of tubercular peritonitis in which a cure quickly

* *Brit. Med. Journ.*, Epitome, Sept. 9, 1899.

followed the injection of a solution of iodine made by dissolving 15 grains of iodine and 30 grains of iodide of potassium in 1½ ounces of water. They injected first half a syringeful and then a syringeful in the genital region daily for ten days, and then on alternate days. After about a fortnight some of the fluid was withdrawn from the peritoneal cavity and examined bacteriologically; culture preparations were made, and guineapigs were experimented on, but no tubercle was found. After ten weeks of treatment the patient was discharged cured.

Schomann * has successfully treated tubercular peritonitis by drawing off the fluid with a large cannula, and then injecting 1 to 2 c.c. of a 1 per cent. emulsion of iodoform in glycerine, gradually increasing the dose and the concentration, and repeating the injection every four to eight days.

It is highly probable, as suggested by Osler, that spontaneous cure occurs in many cases of peritoneal tuberculosis, just as it does in pulmonary tuberculosis, by the tubercle undergoing retrograde, fibroid, and sclerotic changes.

Fagge † remarks "that in children tubercular peritonitis is capable, in the majority of cases, of being cured by the local application of linimentum hydrargyri." The liniment is spread freely over the surface of a flannel belt, which is stitched round the abdomen. He has seen the greater part of the ascitic fluid removed within a few days under such treatment, together with improvement in health and strength. Unguentum hydrargyri may be used instead. Cod-liver oil and syrup of the iodide of iron may be given at the same time. If diarrhœa is present, bismuth and chalk will be useful, and a drop or two of laudanum may be added if pain calls for relief.

In cases with much ascitic fluid in children repeated aspiration or tapping has been attended with successful results.

* *Centralbl. für Chirurgie*, No. 49, 1904.

† "Principles and Practice of Medicine," vol. ii., p. 320.

Replacement of the fluid by normal saline solution has been recommended with a view to stimulating the effusion of antibacterial serum.

Tuberculin treatment, in our experience, has not yet established a claim to be regarded as a reliable means of treatment of tubercular peritonitis. Others, however, regard it as of the highest value, particularly in those cases in which fluid is present. Initial small dosage, and care to avoid reaction in the subsequent doses employed, are laid down as conditions of success.

An important question in connection with the treatment of tubercular peritonitis is, what are the cases in which we should recommend the operation of laparotomy?

According to Sir W. Watson Cheyne * the best results are obtained in the early stage, and when there is always more or less ascitic fluid in the peritoneal cavity; in this stage there is "not necessarily any matting together of the intestines or shrinking or adhesion of the omentum and mesentery." But in advanced chronic cases you may find adhesions and fibroid induration of the omentum and mesentery —they become matted together, thickened, and shrunken. The intestines may also be bound together by new fibrous tissue, the tubercles, too, may be found coalesced into large masses undergoing caseation, and the mesenteric glands may be enlarged and caseous. When the disease has reached this stage the conditions are distinctly unfavourable both for surgical and medical treatment. But Watson Cheyne thinks it an error to operate too soon, for if operation is done too early the disease is apt to return.

He recommends that in all cases *medical treatment should be given a reasonable time,* which he estimates at from four to six weeks in the acute cases and from four to six months in the chronic ones. With the improved methods of medical treatment that

* Harveian Lectures on the "Treatment of Tuberculous Disease in their Surgical Aspects," 1900.

have been adopted of late years, the cases that will require surgical operation are very few. The operation he recommends is a very simple one; in cases with effusion without adhesions the abdomen should be opened in the middle line below the umbilicus and the fluid allowed to run out, aided by turning the patient on his side and "perhaps removing some of it by means of sponges," then stitching up the wound again. He does not recommend washing out the peritoneal cavity unless the effusion is purulent; in that case he advises the use of salt solution for this purpose and then introducing a little iodoform and glycerine emulsion into the cavity before closing it. He also urges that medical measures should be superadded to the surgical ones as soon as possible. Ebstein supports Watson Cheyne's opinion that "simple opening of the peritoneum" is best, "without antiseptics and without washing out or drainage."

As to the rationale of the cure of tubercular peritonitis by this simple surgical operation, we think Watson Cheyne's own suggestion is a reasonable one —viz. that after the removal of the fluid from the peritoneal cavity by incision, serum having antibacterial properties may be poured out, and so the morbid process be arrested. If so, removal of the fluid by aspiration should be as beneficial as by open incision. Perhaps we might look for better results from laparotomy in the dry form of tubercular peritonitis, if irrigation of the peritoneal cavity with saline solution were systematically adopted.

The important fact resulting from these observations is that an apparently very slight change in the environment of a pathogenetic organism suffices to arrest or nullify its activities, and to lead to its disappearance. This consideration led us to reflect how iodoform inunctions (together with iodoform internally) act in curing tubercular peritonitis.

Professor Thoma, of Geneva,* has advocated the treatment of tubercular peritonitis by creasote given

* *Lancet*, Jan. 16, 1897, p. 159.

in enemata. He gave at first 5 minims, increased afterwards to 15 minims, in 4 ounces of emulsified cod-liver oil, once daily. He continued this for some weeks, and then interrupted the treatment for five or six days. He obtained good results. He remarks that "laparotomy is no doubt the best and quickest of all methods for dealing with those cases in which the peritoneum is covered with miliary tubercles, but," he very sensibly adds, "it is always a serious operation, and one also which not every practitioner is competent to perform, and moreover parents often object, and physicians would gladly welcome other methods."

ADDITIONAL FORMULÆ

For diarrhœa in peritonitis

℞ Acidi tannici, gr. xv.
Opii puri, gr. jss ad iij.
Pulveris acaciæ, ʒj.
M. et divide in pulv. x. A powder every two hours.
(*Prof. Braun.*)

Opium powders for peritonitis

℞ Pulveris opii, gr. ix.
Sacchari albi pulveris, ʒjss.
M. et divide in pulv. xij. A powder every two hours.
(*Bamberger.*)

For severe vomiting in peritonitis

℞ Morphinæ hydrochloridi, gr. jss.
Aquæ laurocerasi, ʒjss.
Misturæ amygdalæ, ℥vj.
M. f. mist. A tablespoonful every hour. (*Braun.*)

Opium and belladonna pills for peritonitis

℞ Pulveris opii, gr. j.
Extracti belladonnæ alcoholici, gr. $\frac{1}{24}$.
Bismuthi oxidi, gr. j.
M. f. pil. To be taken four times a day. (*Whitla.*)

Aconite and opium in peritonitis

℞ Tincturæ aconiti, ʒij.
Tincturæ opii ad ℥j.
M. f. tinct. Ten to fifteen drops every hour or two.
(*Bartholow.*)

Morphine powders for peritonitis

℞ Morphinæ hydrochloridi, gr. ij.
Sacchari albi, gr. xxx.
M. et divide in pulv. vj. A powder every hour or two.
(*Braun.*)

Naphthol camphor in tubercular peritonitis

After the withdrawal of rather more than a pint of fluid from the abdomen in a case of tubercular peritonitis in a boy 13 years of age, about 3 drams of a solution of naphthol camphor was injected into the abdomen, and complete recovery followed. Naphthol camphor is a viscid liquid made by mixing 1 part of β-naphthol with 3 parts of camphor.
(*Spillman.*)

PART II.—DISEASES OF THE HEART AND BLOOD-VESSELS AND OF THE BLOOD AND DUCTLESS GLANDS

CHAPTER XV

TREATMENT OF ACUTE AFFECTIONS OF THE HEART AND PERICARDIUM

ACUTE PERICARDITIS: Etiology—Acute Rheumatism—Bright's Disease—Septicæmia—Pneumonia—Scarlet Fever—Tuberculosis—Forms of Pericarditis—Often Latent—Symptoms—*Indications for Treatment*—Sodium Salicylate—Food and Stimulants—Opium—Aperients—Ice-bag—Leeches—Bleeding—Warm Fomentations—Support of the Heart—Blisters—Iodine—Potassium Iodide and Digitalis—Tonics—Puncture and Aspiration—Incision in Hæmorrhagic and Purulent Effusions—Adherent Pericardium and Cardiolysis.

ACUTE ENDOCARDITIS AND MYOCARDITIS: Its Nature—Etiology—Micro-organisms—*Indications for Treatment*—Alkalis—Salicin and Quinine—Value of Water—Formulæ—Opium—Ice-bag—Blisters—Alcohol—Strychnine—Food—Rest—Potassium Iodide—Tonics—Digitalis.

MALIGNANT OR ULCERATIVE ENDOCARDITIS: Its Relation to Septic Processes and to Microbic Action—Septic Emboli—Generally ends Fatally—*Treatment* with Antiseptics, with Sulphocarbolates, Formalin, Nuclein, Normal Horse Serum—Serum- and Vaccine-therapy.

Additional Formulæ.

IN considering the subject of the **treatment of diseases of the heart** we shall be chiefly concerned with those *chronic* affections of that organ which involve some lesion of one or other of its sets of valves, or of its muscular structure, or of both; but we shall also have to discuss the treatment of *acute* affections of the heart, and of its covering, the pericardium. This, however, will be done briefly, because these *acute* inflammations generally arise as complications of other diseases, the full treatment of which will be found under their appropriate headings.

Pericarditis

Pericarditis rarely, if ever, occurs as a primary idiopathic disease; some authorities, however, believe it does so in childhood; it is almost invariably secondary to some general malady, or it occurs as an extension of inflammation from some adjacent part. Usually it is only a part of a general inflammation of the heart which affects the myocardium and the endocardium as well.

Acute rheumatism is by far the most common cause of pericarditis, especially in children and young adults, and the pericarditis has been observed, more particularly in the former, occasionally to precede the joint affection. Bright's disease is another cause of pericarditis. It is questionable whether we should refer the inflammation to the irritant action of toxins in the blood, or to the invasion of bacteria, in the presence of a lowered resistance. It is usually a terminal event and little amenable to treatment. Pericarditis is also apt to occur as a consequence of certain septic and infective processes, as in puerperal fever and pneumonia. It sometimes appears as a complication of the eruptive fevers, particularly of scarlet fever, in childhood. A tuberculous form occurs in connection with tuberculosis of the serous membranes. It may arise by extension from left pleuro-pneumonia, and it may occur in consequence of disease of the adjacent chest-wall, or mediastinal structures, or neighbouring abdominal viscera, and it may be caused by pyæmic abscess of the myocardium.

In many of these connections it is simply one of the manifestations occurring in the progress of an inevitably fatal malady.

Three forms of pericarditis have been described:

1. A *dry* form, in which there is simply a fibrinous exudation on the surface of the serous membrane.

2. Pericarditis *with effusion*, either sero-fibrinous, hæmorrhagic, or purulent.

3. An adhesive form, in which the pericardium becomes adherent to the surface of the heart.

The gravity of acute pericarditis, in the absence of effusion, *depends more on the almost invariable involvement of the myocardium* than on the inflammation of the pericardium itself.

The physical signs of acute pericarditis should be carefully looked for in the course of all those affections which are prone to give rise to this disease. This is the more important, as it is apt to be **latent,** especially when it occurs in connection with Bright's disease, and **general symptoms** may be entirely absent. More commonly, however, complaint of *pain* in the præcordial region is the first indication of the occurrence of pericarditis. The pain is sometimes intense, and radiates over the chest and down the left arm. Great and distressing dyspnœa may be another prominent feature in acute pericarditis, especially when there is great dilatation of the heart. Sometimes there is a great disturbance of the cardiac action with palpitation and a rapid and irregular pulse, and on examination the area of cardiac dullness is found to be greatly increased, particularly in an upward direction towards the left clavicle.

The **indications for treatment** are, first, to neutralise or remove the cause of the inflammation; secondly, to check the local hyperæmia and effusion; thirdly, to rest the heart and support its strength; fourthly, to relieve pain and distress; fifthly, to promote absorption of the effusion, or, in the very rare instances in which it accumulates in sufficient amount to hamper dangerously the work of the auricles, to remove it by operation; and, lastly, to reduce the heart to its normal size prior to adhesion. Absolute rest in bed is, of course, essential, and we may add that pericarditis would often be prevented if the first warning of pain in the joints in a rheumatic subject, particularly in one with old endocarditis, were taken as an indication of the necessity for immediate resort to bed. As a prelude to further

treatment the bowels should at the outset be cleared by a brisk purge: calomel is perhaps the best, followed, if need be, by a saline draught.

In rheumatic cases sodium salicylate or salicin in combination with sodium bicarbonate may be given so long as the arthritic symptoms remain unrelieved. Some American writers on therapeutics object to the use of salicylates* in cases of rheumatic pericarditis. We cannot share this view, for if the salicylates (or salicin) are indicated in the treatment of ordinary attacks of polyarthritic rheumatism, the additional affection of a visceral *joint*—as, in a certain sense, the pericardium may be termed—can hardly contra-indicate its use. There can be little doubt that much of the circulatory depression attributed to salicylates should be written down to the account of the rheumatism for which the drug is being administered. The same rules as govern the administration of salicylates in rheumatism apply equally in pericarditis, but we must not expect to find the same manifestly good influence on the rheumatic process in the heart as is seen in the case of the joints. Food should be light, and is best given in small amounts at frequent intervals: light puddings, whipped eggs, milk, bread and milk, oatmeal gruel: sometimes more solid food, such as scraped meat, or even the lighter kinds of fish or chicken, is well taken. Occasionally constant vomiting makes the feeding of the patient extremely difficult: then teaspoonfuls of good beef-extract, small feeds of whey or skim-milk, and now and again a dessertspoonful of iced brandy and soda water may be tried: or complete withdrawal of food for a few hours, without having recourse to rectal feeding.

It is doubtful whether we can do much to check the local hyperæmia in the pericardium or to stave off effusion. Blisters, the ice-bag, and leeches may

* We shall have to discuss the use of the salicylates in acute rheumatism in a subsequent chapter (Chap. LIII.).

all be employed with this purpose in view, though these measures are more specially suitable for the next indication, which is the relief of pain and distress.

Opium combined with saline diaphoretics is very useful in those cases in which there is much præcordial pain. We prefer to give it to children in the form of Dover's powder, 5 grains with a dram or two of liquor ammonii acetatis, every three or four hours, until the pain is subdued. To older children and adults we permit the use of morphia by hypodermic injection, always guarded by atropine or strychnine. To ensure a free action of the bowels, especially during this opium treatment, an efficient saline aperient should be given daily. Two or three drams of sodium sulphate in 1½ ounces of infusion of senna usually answers well.

The application of an **ice-bag** to the præcordial region is a valuable remedy for relieving pain and quieting cardiac action. It is not so popular as it deserves to be in England or in America, but when applied early and thoroughly it has proved in many cases very efficacious. If the patient is recumbent, the ice-bag may be suspended from a cradle, so as to reduce its weight on the chest. Usually, however, the patient is propped up by a bed-rest and pillows in a sitting position; then the ice-bag must be braced in position by a tape round the neck, and by others attached to its lower corners and passed round the body. It should have a covering of lint or flannel to absorb any moisture that may condense on its surface. The ice in the bag should be changed every two or three hours. It may be applied to the præcordium continuously for days, if needed, provided the precaution be taken of keeping the rest of the body thoroughly warm, using hot bottles if called for. The nurse should be instructed to keep a constant eye on the temperature: if it falls below normal, it is desirable to remove the ice-bag for a time. When the use of the ice-bag is objected to, the pain and

distress may generally be greatly relieved by the application of three or four leeches over the præcordium, followed by a hot linseed poultice sprinkled with laudanum. General bleeding is rarely called for, although Fagge observes: "When there are symptoms of embarrassed circulation with orthopnœa and distress, an irregular pulse, arterial anæmia, and venous congestion, the abstraction of 4 or 5 ounces of blood from the arm is found in some cases to give remarkable relief, and probably is never injurious."

Warm applications, as hot flannels, hot cotton-wool, and hot poultices, to the præcordial surface are usually comforting. When hot applications are removed it is well to cover with a pad of cotton-wool or flannel the area to which they have been applied. In rheumatic cases, when the depressing effect of the salicylates is to be feared, or when the joint inflammation is subdued, quinine in moderate doses, 1 to 3 grains, may be given in effervescence in combination with potassium citrate.

In acute pericarditis, even in the absence of effusion, the heart will often need all the support we can give it. At this stage digitalis is useless and often harmful. We must depend on strychnine or ether, given frequently under the skin. The ice-bag often affords valuable help.

Sleep is one of the best of cardiac tonics, and may demand the use of opium or morphia. If we cannot increase its power, we may still diminish the resistance against which it has to work by laxatives, or by the free abstraction of blood by means of half a dozen leeches.

As soon as the acute symptoms have subsided we must keep in mind the likelihood of adhesion, and endeavour to reduce the heart to its normal size prior to its occurrence. Complete and protracted rest, aided by digitalis, are the most potent agents in effecting this end.

When we have effusion to deal with, the absorp-

tion of which we are anxious to promote, blistering will frequently be found most useful. In rheumatic cases large effusions will constantly be found to disappear rapidly after the application of a succession of small blisters, followed by hot poultices. In renal cases cantharidine applications are, however, to be avoided, but we may then resort to the use of strong iodine paint; or a mustard leaf, applied till the skin is thoroughly red, then to be followed by a succession of hot fomentations. Potassium iodide, alone, or combined with digitalis and other diuretics, such as acetate or citrate of potash, will be found, in the later stages, a valuable agent for promoting the disappearance of the effusion.

If cardiac failure should threaten, supporting remedies must be freely applied, as quinine, strychnine, ether, ammonia, alcohol, etc. In urgent conditions, inhalations, at intervals, of oxygen that has bubbled through a bottle of alcohol give great relief. Light food, but not with too much fluid for fear of increasing the effusion, should be given.

When a large effusion is seriously compressing the heart and embarrassing its action, so that the pulse becomes increasingly weak and irregular, with a tendency to syncopal attacks: when dyspnœa is grave, and the above measures have failed—or if there is reason (from exploratory puncture with a hypodermic syringe) to believe the effusion to be purulent—removal of the fluid by **aspiration** or **incision** of the pericardium has to be considered. We cannot insist too strongly that the cases in which aspiration of a serous effusion is called for are very few and far between. Again and again we have seen the higher grades of dilatation confidently diagnosed as pericardial effusions, and treated as such.

After carefully percussing and outlining the *lateral* limits of the area of dullness, the nature of the fluid effusion should first be ascertained by puncture with the needle of a hypodermic syringe, carefully rendered aseptic. Perhaps the best situation for this

and subsequent puncture is the 5th left intercostal space, either close to the left margin of the sternum or about 2 inches externally, so as to avoid the internal mammary artery, and with the needle directed downwards and somewhat inwards. Other situations have been recommended for puncture: for instance, the 5th intercostal space, close to the right border of the sternum; or the left costo-xiphoid angle, thrusting the needle upwards and backwards close behind the sternum; or, again, in large effusions, which will have displaced the lung, so that there is no fear of wounding the pleura, outside the nipple line and internally to the outermost limit of dullness.

If the fluid is serous or sero-fibrinous, then a fine aspirating needle should be cautiously introduced in the same spot and moved slowly forwards. Local anæsthesia may be obtained by freezing with ethyl chloride, or by injecting a few drops of a 5 per cent. solution of eucaine lactate into the skin and subcutaneous tissue. We should be prepared to clear the needle, as it often becomes blocked with shreds of fibrin. It is probably wise to remove as much fluid as possible, provided it is done very slowly. On removal of the needle the puncture should be covered by a collodion dressing. If the fluid is found to be *hæmorrhagic* or *purulent*, then an incision must be made under general anæsthesia with ether into the pericardium by the low costo-xiphoid route, so as to ensure free drainage, which may be promoted by propping the patient up in bed with pillows, after recovery from the operation. In this manner it is usually possible to dispense with irrigation. So severe an operation should be undertaken only by an experienced surgeon.

During convalescence the patient should be carefully watched and protected against all depressing agencies. A prolonged period of almost absolute rest should be insisted upon, as the myocardium is often involved, and the risk of aggravating any resulting cardiac dilatation is not to be overlooked. Light but nourishing

food should be ordered, and the diet carefully watched to note if any digestive disturbances arise. In mild weather reclining in the open air has both a quieting and strengthening influence on the heart. The best means we have of counteracting the ill effects of adherent pericardium is to secure full compensatory hypertrophy of the heart, and this we shall consider in the chapter on chronic valvular disease.

Brauer has suggested the operation of *cardiolysis* for certain cases, in which the action of the heart is seriously embarrassed by adhesion of the pericardium not only to the heart itself, but also to surrounding structures and to the chest-wall. The operation consists in the resection of the cartilages of the 4th, 5th, and 6th ribs of the left side, together with portions of the ribs themselves, and even of the adjacent sternum, when these are involved in the adhesions. The degree of success obtained, even in the most favourable of the reported cases, leaves much doubt as to the propriety of the procedure.

Acute Endocarditis and Myocarditis

"**Simple**" or "**benign**" endocarditis, the form which is commonly met with, is not regarded by some pathologists as presenting any essential difference in nature from that rarer form which, from its fatal character, is spoken of as "*malignant*" or "*ulcerative*" or "*infective*" endocarditis. Osler says: "There is no essential anatomical difference, as all gradations can be traced, and they represent but different degrees of intensity of the same process."

But clinically, in course, symptoms, and results, the distinction between the two forms is very obvious.

We must consider briefly the pathological nature of this disease, so far as it is at present understood, before we can establish rational indications for its treatment. In simple endocarditis **minute vegetations** appear on the endocardium covering the valves or lining the cavities of the heart. These vegetations are often attached by very slender pedicles, so that

they have a cauliflower-like form. They have an irregular, cracked surface, giving them a warty aspect. The appearance of these vegetations is accompanied by a proliferation of the sub-endothelial connective tissue elements. A deposit of fibrin from the blood occurs on the surface of these projections, so that a vegetation has been described as practically "a small area of granulation tissue capped with fibrin." Micro-organisms are often found entangled in the deposited fibrin.

In the majority of cases the granulation tissue undergoes cicatrisation, and leaves only a slight nodular thickening of the valve. It is uncommon in acute febrile endocarditis for a vegetation to be detached and carried as an **embolus** to a distant part of the circulation, but this accident is frequent in that form of endocarditis which attacks old sclerotic valves.

Along with the changes in the valves foci of inflammatory exudation will be found in the heart muscle: in these the infecting organisms elaborate those poisons that induce the myocardial enfeeblement and dilatation which is the outstanding feature in acute endocarditis.

The most serious consequence of an attack of simple acute endocarditis is the subsequent tendency to slow progressive sclerosing changes in the valve tissues, and the ultimate contraction and deformity to which it leads. It is remarkable that the left side of the heart, except in fœtal life, is so much more often affected than the right, and it has been suggested that the inflammatory poison must need oxygenated arterial blood for its activity. We think, however, that the difference is more apparent than real, inasmuch as resolution is far more probable under the low pressure conditions of the right ventricle than is the case in the left. Moreover, the difficulty of detecting the evidences of the initial lesion of the valves of the right side of the heart is much greater than with those of the left side. The mitral valve is more frequently affected than the aortic.

With regard to the **etiology** of simple acute endocarditis, it must be borne in mind that, except in the rarest instances, it does not occur as a disease of itself, but is always a complication of some other affection, and in the vast majority of cases that affection is acute rheumatism. It also occurs in connection with chorea, tonsillitis, scarlet fever, and most of the eruptive fevers, acute pneumonia, phthisis, and gout. It is prone to take a recurrent form, attacking those valves already disabled and crippled by former attacks. Micro-organisms reach the valves chiefly by the microscopic capillaries in the deeper tissues, but also in a less degree from the main blood-stream, finding their way directly between the endothelial cells. This latter mode of invasion would necessarily be more effective on the left side of the heart than on the right, owing to the difference o pressure. Although there is every reason to regard this benign form of acute endocarditis as microbial, it is clinically convenient to reserve the designation for those cases in which examination of the blood fails to reveal their presence, so that an essential difference exists from the malignant type in the **indications for treatment.**

These are: firstly, in the presence of any of the causal diseases, and especially in the case of acute rheumatism and chorea, by means of absolute rest and appropriate treatment, to stave off the occurrence of endocarditis; secondly, when prevention is no longer possible, to remove or to mitigate the exciting cause; thirdly, to minimise the strain on the heart muscle and to maintain its strength; fourthly, to relieve pain and distress; fifthly, with subsidence of the acute symptoms so to order convalescence that the heart may regain the full power compatible with the permanent damage to the valve.

A brief experience of hospital practice, where for one cause and another it is often impossible to treat the first threatening of a rheumatic process

with *absolute rest in bed*, is sufficient to teach us that by this means alone much may be done to stave off an attack of acute rheumatism both from the heart and from the joints. If, however, there is evidence that the endocardium is already affected, we must forthwith attempt to arrest the disease of which it is a complication; and as this is generally acute rheumatism, it is scarcely possible to consider the treatment of simple acute endocarditis apart from that of acute rheumatism. The indication for treatment is, therefore, to modify, if possible, the disordered state of the blood which has excited the inflammation. We believe the best treatment for these cases is a combination of alkalis and salicin, with which we would also combine some moderate doses of quinine. We do not look for the same influence on the process in the endocardium as in the joints, but still we are satisfied that we often derive some beneficial effects. Alkalis and salicylates reduce arterial pressure by stimulating the functions of the skin and kidneys. Another means of modifying the blood condition and its irritating effects on the endocardium is the free administration of diluent fluids, and especially of pure water, provided that elimination by the kidneys is free and unimpaired, taking care at the same time to maintain free action of the bowels. Instead of giving the patient strong meat essences and broths to drink, which, for aught we know, may have a very injurious influence on the blood condition, we prescribe pure warm water slightly flavoured with lemon juice, and we give no food in the early stages (when there are no signs of exhaustion), but milk diluted with an alkaline water, a little warm weak broth, and thin gruel. All through the early acute stage the food should be very light. The indication, we venture to urge, is to wash out the contaminated blood. The stomach cannot absorb large quantities of food and water at the same time, and we consider the latter of the greater importance at the outset of this disease. We suggest the following formula as a most useful

combination in cases of rheumatic endocarditis either threatening or established :—

℞ Salicini ... ... ʒj.
Potassii bicarbonatis ... ... ʒiv.
Sodii carbonatis ... ... ʒij.
Aquæ ... ... ad ℥xij.

Misce, fiat mistura. Two tablespoonfuls every two hours while the acute febrile state continues, with two tablespoonfuls of the following mixture :—

℞ Quininæ sulphatis ... ... gr. xxiv.
Acidi citrici ... ... ʒiij.
Tincturæ limonis ... ... ʒj.
Aquæ ... ... ad ℥xij.
Misce, fiat mistura.

In this way the patient will get 60 grains of salicin and 24 grains of quinine in twenty-four hours, dissolved in 24 ounces of alkaline solution.

The alkalis and alkaline citrates, by diminishing coagulability of the blood, may tend to diminish the deposition of fibrin on the valves.

Objection has been made to the use of sodium salicylate in these cases on account of its depressing effect, but the preceding formula is not open to that reproach. The advocates, however, of the use of the sodium salt maintain that the pure natural salicylate is not depressing.

When rheumatic endocarditis is accompanied by pain and distress in the præcordial region, a full dose of Dover's powder (12 to 15 grains) should be given at night, or in a strong subject a hypodermic dose of morphia, always guarded by strychnine or atropine, and a hot linseed poultice sprinkled with laudanum applied to the præcordia. This will not only relieve cardiac pain, but it will also quiet cardiac excitement. The application of the ice-bag is preferred by some physicians, and we think it valuable, especially in children. The ice-bag is particularly indicated when acute dilatation leads to great pain and exhaustion. When applied for protracted periods, as already described in the treatment of acute pericarditis, its

tonic and sedative action on the enfeebled heart muscle is marked: dullness recedes in some cases with astonishing rapidity. The application of blisters to the præcordia has been advocated, and they may be of use in protracted cases. If sedative drugs are indicated, frequent small doses of the alkaline bromides may be given; but if sleeplessness is great and seems to exhaust the heart, we must have recourse to a single sufficient dose of morphia without delay. Occasionally the fever is sufficiently distressing to call for special treatment, which may be most effectively given in the form of tepid sponging.

To sustain and strengthen the heart, the remedy of prime importance is *absolute rest in bed.* In the absence of signs of great weakness of the heart, all drugs that stimulate the action of the heart are contra-indicated. Digitalis must not be given, as it is directly harmful by increasing the strain on the injured valves.

In the severer forms with very rapid action of the heart and much exhaustion, the administration of alcoholic stimulants is indicated. Small frequent doses of strychnine, ether, or camphor may also be given subcutaneously; and the diet should be made more stimulating by the addition of beef-juice, meat extracts, meat jelly, or egg-flip. If vomiting interferes with the taking of food it should be treated on the lines we have laid down in the treatment of acute pericarditis. We have sometimes received help from inhalations of oxygen in the presence of profound exhaustion of the heart with threatened asphyxia.

During convalescence *absolute repose* must also be long insisted upon after an attack of endocarditis, with the same object. It is clearly of the greatest importance to avoid premature strain on valves softened and impaired by inflammatory changes. For the first three months it is well to insist on complete rest in bed: after this another three months of modified recumbency on a sofa, as much as possible in the

open air, is desirable, and during this period resisted movements may be used, as a preliminary step to brief and gentle exercise. Not till a full year has elapsed should full freedom of exertion, always within the capacity of the injured heart, be permitted. The long-continued use of potassium or sodium iodide in small doses, together with a vegetable tonic, after the attack, has appeared to us to be sometimes instrumental in removing the physical signs of valvular changes, and we believe it diminishes the tendency to progressive sclerotic changes both in the valves and in the vascular walls. Great care in diet, which should be of the lightest, must be observed, and due elimination maintained by the judicious use of aperients. Iron, arsenic, and other tonics will usually be needed, and at this stage, if the heart is unduly enfeebled, digitalis may help to restore tone to its muscle. It may appropriately be given in combination with sodium iodide.

Malignant, Ulcerative, or Infective Endocarditis

This condition does occur as a primary affection of the endocardium, but far more often represents a fresh infection grafted on to valves that are the seat of former disease: for this reason any remediable focus of infection, such as pyorrhœa alveolaris or affections of the sinuses, in the subjects of valvular disease should be promptly dealt with. Various micro-organisms have been found. Streptococci have been most frequently found, either in pure culture or in association with other organisms. Pneumococci, gonococci, meningococci, staphylococci, the bacilli of influenza, typhoid, diphtheria, and tuberculosis have all been identified causally with the infective process. Thus it is prone to occur not only in connection with septic processes of every kind, but also as a sequel of any of the above-named specific infections. With recent improvements in the technique of blood examination, reducing to a minimum the likelihood

of septic contamination in the course of the manipulations, it has become generally recognised that organisms are present in pure culture far more commonly than was formerly supposed.

The clinical picture is apt to be very variable. The disease is a generalised infection, and the signs of a diffuse toxæmia tend to overshadow the destructive disease in the heart. Quite often indeed the evidence of involvement of the endocardium is sought for in vain during life. Rigors, sweating, irregular or periodic pyrexia, progressive weakness and cachexia, are prominent symptoms, and the diagnosis is confirmed by the physical signs of a diseased heart, along with the detection of micro-organisms in the general blood-stream. The affection is characterised, as its name implies, by ulcerative and suppurative processes affecting chiefly the valvular endocardium, but showing also a tendency to spread to the mural endocardium. The necrotic process leads to superficial or deep ulceration which may even perforate a valve or a septum ; and small abscesses may be found at the base of the vegetations. The transfer of septic emboli from the heart to various parts of the body, especially the spleen, kidneys, and lungs, where they may set up septic suppurative processes, is one of the most serious consequences of this disease.

Most cases of ulcerative endocarditis terminate fatally and run a somewhat rapid course, varying from a week or two up to several months ; a more chronic process, extending over two or three years, may occur in some of the cases that are seen in connection with old sclerotic valve disease : in such cases the infecting agent is usually the *Streptococcus mitior*.

The general **indications for treatment** are the same as those employed in the treatment of the benign form, but the detection of micro-organisms in the blood-stream, or in some local focus of infection, will call for additional measures directed to inhibiting their activity, or to neutralising their toxic products.

If any focus of infection be discovered, outside the

general circulation, it must of course be dealt with at the outset, but too often the only discoverable focus is that in the heart itself. **Antiseptic drugs,** such as sulphocarbolate of soda and the benzoates, have been abundantly employed, but with no satisfactory results. Irrigation of the blood with intravenous injections of formalin has been recommended : we have ourselves administered in this manner doses of 50 c.c. of 1 part of formalin in 2,000 of normal saline solution at a time, but we cannot recommend its adoption.

With the object in view of creating an artificial leucocytosis, **nuclein** has been used in those cases in which a leucopenia is found to exist. It is best administered subcutaneously : 15 minims of a 5 per cent. solution of the sodium salt of nuclein may be given as an initial dose, and, if it is desired to push the drug, solutions of double this strength may be subsequently given. **Normal horse serum** may be tried, with this same objective, in daily subcutaneous doses of 10–20 c.c.

Great hopes have been entertained of the various **antibacterial sera,** but it must be frankly admitted that so far little has resulted but disappointment. The rational procedure would of course be to prepare an antiserum from the patient's own organism, but the lengthy preparation involved usually renders this impracticable. Horder* accomplished this in a severe case of streptococcus endocarditis, but failed to avert the inevitable fatal termination. If we succeed in identifying a special form of streptococcus, we shall of course employ a stock antiserum of corresponding type. Failing such, we have to be content in the majority of cases with the use of a polyvalent **antistreptococcic serum. Antipneumococcic serum** has been injected in a number of cases in which the pneumococcus has been isolated, and the **antistaphylococcic serum** in cases due to staphylococci. These various antisera are all supplied by the leading firms of dispensing chemists : 25 c.c. is an

* *Lancet*, July 16, 1904.

efficient initial dose of most of these antisera. It must be borne in mind, however, that this and the interval between doses call for intelligent variation, according to the characters of individual cases. An interesting recovery* is fully recorded as the result of the combined use of an autogenous serum and an autogenous vaccine.

Bacterial vaccines have now been extensively tested in those cases of infective endocarditis in which a micro-organism has been isolated from the blood. We have ourselves employed such vaccines, and seen them employed in a number of cases, without manifest advantage in any. Horder observed some temporary betterment in an infection with the bacillus of influenza, but like ourselves has been discouraged by the results he has habitually obtained. We venture to think that the brilliant results claimed by some physicians in reported cases of staphylococcal endocarditis, from the use of staphylococcic vaccines, point rather to the presence of the staphylococcus as an accidental contamination. Although stock vaccines of most types are supplied by the chief dispensing chemists, we would insist on the importance of using an autogenous vaccine, prepared from the organism derived from the patient himself. If the practitioner is without the facilities for its preparation, the vaccine may be prepared for him by any skilled bacteriologist, on receipt of a pure culture prepared by himself, or of other suitable material. In the case of streptococcic, pneumococcic, and influenzal vaccines the initial dosage should not exceed 5 millions, and in that of staphylococcic vaccines 50 millions, and subsequent dosage and the time for its repetitions will depend on the character of the reaction to the initial dose, and the later symptoms.

Acute myocarditis, which almost invariably accompanies acute pericarditis and acute endocarditis, presents no special therapeutic indications apart from those already considered.

* *Lancet*, Jan. 4, 1913.

ADDITIONAL FORMULÆ

Cooling acid mixture in pericarditis

℞ Acidi phosphorici diluti, ℥ss.
Syrupi mori, ℥v.
Aquæ ad ℥vj.

M. f. mist. A tablespoonful every hour. (*Bamberger.*)

As a cardiac tonic and febrifuge in pericarditis

℞ Quininæ sulphatis, gr. vj ad xviij.
Sacchari albi, gr. lxxx.

M. et divide in pulv. vj. One every three hours. (*Bamberger.*)

In ulcerative endocarditis

℞ Quininæ sulphatis, gr. xij ad xxxvj.
Acidi citrici, gr. xxiv ad lxxij.
Syrupi limonis, ℥j.
Aquæ chloroformi ad ℥vj.

M. f. mist. A tablespoonful every three or four hours.

Mixture in convalescence from endocarditis

℞ Potassii iodidi, gr. xxxij.
Potassii bicarbonatis, gr. lxxx.
Spirit. ammon. aromatici, ℥iv.
Tincturæ cinchonæ comp., ℥j.
Aquæ ad ℥viij.

M. f. mist. A tablespoonful three times a day.

CHAPTER XVI

TREATMENT OF CHRONIC AFFECTIONS OF THE CARDIAC VALVES

CHRONIC VALVULAR LESIONS: General Therapeutic Indications—Etiology—Mechanical Effects and Consequences—Hypertrophy and Dilatation—*Treatment* of *Compensated Cases*—Regimen — Exercise — Avoidance of Excitement — Food and Stimulants—Alcohol—Tea—Coffee—Tobacco—Thermal Treatment — Aperients — Climate — Drugs rarely needed —Iron — Arsenic — Sodium Bromide — *Treatment of Non-compensated Cases*—Effects of *Mitral* Failure — Pulmonary Engorgement — Dyspnœa — Cough—Expectoration—Hæmoptysis—General Venous Engorgement—Enlargement of Liver —Gastro-intestinal Catarrh — Constipation — Scanty Albuminous Urine—Cyanosis—Dropsy—Effects of Failure of *Aortic* Valves—Pallor—Cerebral Anæmia—Palpitation—Pain —Dyspnœa—Orthopnœa—Frequency of Embolism — Chief Therapeutic Indication, to raise the Cardiac Tone—Importance of Absolute Rest—Diet—Cardiac Tonics—Digitalis—Strophanthus and Strophanthin — Squill—Caffeine—Convallaria — Sparteine — Adonis vernalis—Cactus grandiflorus—Strychnine—Quinine—Coca—Kola — Iron — Restored Compensation. Additional Formulæ.

WE now pass on to consider the management of those chronic disorders of the cardiac mechanism dependent on disease of its valves, and of the several morbid states which arise therefrom.

In considering the management of valvular diseases we shall have to draw a marked distinction between *compensated* and *non-compensated* cases.

Apart from the treatment of certain complications and special symptoms, the therapeutic problem presented to us in dealing with these cases may be summarised in the three following indications:—

1. To arrest or retard degenerative processes.

2. To diminish the mechanical work of the heart, i.e. to diminish the resistance.

3. To raise the tone of the cardiac muscle, i.e. to increase its power.

We shall show, as we proceed, what means we have at our disposal for fulfilling these indications.

With regard to **chronic valvular lesions,** we have already seen that these often originate in an attack of acute endocarditis, and especially in rheumatic endocarditis; the thickening and deformity of the valve may be but slight at the end of the acute attack, but the valve so injured is liable to undergo further deformity by becoming the seat of chronic endocarditis, which may ultimately lead to serious impairment of its functions.

But chronic endocarditis leading to sclerotic changes in the valves may arise from other causes than rheumatism, as from syphilis, gout, or alcoholism. Another cause of chronic valvular disease, especially of the aortic valves, is strain from excessive muscular exertion. In severe and sustained muscular labour there is an increased strain imposed on the aortic valves during the ventricular diastole, and this, particularly if any toxic influence is superadded, in time may set up chronic endo-arteritis and sclerotic changes in the valve segments. In some cases the chronic affection of the aortic valve is associated with *atheromatous* changes in the adjacent part of the aorta.

The effect on the mechanism of the heart of these valvular changes is either to narrow and constrict the opening guarded by the valve (*stenosis*), and so diminish the outflow through it, or to render the valve incompetent to close the opening as it should do (*insufficiency*), and so to allow of an abnormal backward flow of blood into the chamber from which it had been propelled. In either case more or less dilatation of one of the chambers of the heart must occur from increase of blood pressure within it. When, as is often the case, constriction of the opening is combined with incompetence of the valve, not only is there an abnormal mechanical difficulty interposed in the propulsion of the blood from one chamber to the other, but there is an additional mechanical distending or dilating

influence from the over-filling of one of the chambers by an abnormal reflux of blood, so that the chamber receives a backward as well as a forward current. These changes take place, as a rule, gradually, and not abruptly, therefore the insufficiency and consequent dilatation are, at first, only moderate, and the natural reserve force of the cardiac muscle may be temporarily equal to overcoming the difficulty. But when the insufficiency is considerable, obviously the cardiac chamber chiefly affected must need greatly increased muscular force to propel so largely increased a volume of blood, and this is provided by an increase or hypertrophy of its muscular walls, and so long as this hypertrophy is adequate to overcome the mechanical difficulty proceeding from the diseased valve, the valvular lesion is said to be *compensated*, and the circulatory equilibrium is maintained. But when the hypertrophied muscle begins to degenerate, and to be inadequate to overcome the effect of the valvular lesion, compensation is said to *fail*, and symptoms dependent on disturbance of the circulatory equilibrium begin to make their appearance. We see, from the foregoing, that cardiac dilatation and hypertrophy are common and necessary consequences of chronic valvular disease, and that the hypertrophy cannot be regarded as in itself a disease, since it usually arises as a natural conservative process.

But **hypertrophy** and **dilatation** of the heart also arise without the existence of valvular disease. Whatever increases the work of the heart may cause its hypertrophy: as, for instance, adherent pericardium, which interferes with and impedes the regular cardiac contractions; and continuous excessive action of the heart, "palpitations," due either to nervous disturbance, such, for instance, as is associated with exophthalmic goitre, or to the action of stimulants, such as tea, coffee, tobacco, or alcohol. Or the increased work may depend on peripheral obstruction, as in general arterio-sclerosis, or on con-

traction of the smaller arteries from the presence of toxic matters in the blood raising the intravascular tension ; or it may be due to prolonged and excessive muscular exertion, which also greatly increases arterial blood-pressure. We must remember that high arterial tension exists quite as often in the underworked and overfed as in those who live a laborious life of manual labour. In all these conditions the work of the ventricle is increased, and it therefore hypertrophies. Hypertrophy of the right ventricle similarly occurs (apart from valvular disease) when any obstruction or increased resistance is encountered in the pulmonary circulation, as in pulmonary emphysema, pulmonary cirrhosis, etc. *No treatment* can be, or indeed should be, directed against this form of hypertrophy, apart from the morbid state that has excited it, as it is mainly compensatory and beneficial.

Dilatation often accompanies hypertrophy, and is dependent on the same causes, i.e. on whatever increases the intracardiac pressure—which may be either an increased volume of blood to be propelled or an increased resistance to be overcome. This requires no more treatment than does the coexisting hypertrophy. But it is not so with all cases of cardiac dilatation and strain, and we shall reserve what we have further to say on the etiology and treatment of dilatation of the heart until we have considered the treatment of chronic valvular affections.

We will first consider the **treatment** of those cases in which **compensation** is perfect and complete.

Such cases require careful and discriminating management. It may not be necessary to administer drugs, it may even be injurious to do so, but in order to maintain adequate compensation, and to prevent or postpone any disturbance of the same, judicious regiminal and hygienic treatment should be maintained.

There exists some difference of opinion amongst physicians whether patients who are found to be the subjects of a compensated valvular lesion should

or should not be informed of the fact. We think that in by far the great majority of cases no harm, but often great good, results from explaining frankly to the patient the true state of the case. The public are rapidly learning that "heart disease" does not necessarily mean premature and sudden death; and if anything could promote such a termination it is to leave them in ignorance of the importance of that judicious care and caution in their manner of living upon which a continuance of sound health depends. A few highly nervous persons may, perhaps, be better left in ignorance of the fact; but when we reflect how common such affections are, and that discussions with regard to their effects on longevity are constantly occurring, without any kind of reserve, in connection with proposals for life assurance, etc., we are inclined to conclude that the mystification occasionally resorted to is unwise and attended with no good result. It often produces more real alarm than a frank explanation of the actual state of matters. We rarely attempt to conceal from a patient that he has phthisis, or cancer, or Bright's disease; why then should we take pains to conceal from him the fact that he has a far less serious malady?

The **mode of life** prescribed for such a patient should, in the first place, be free from all strain or over-exertion, physical or mental. Moderation in all things is the keynote of treatment, and within these limits the physician should aim at imposing as few irksome restrictions as the circumstances of each case permit. The patient should be cautioned against indulging in athletic *competitions*, or undertaking violent or protracted muscular effort of any kind. Gentle, moderate, and regular exercise is useful and necessary, and helps to promote compensatory hypertrophy, but running, jumping, rowing, or hill-climbing, or severe and sustained exertion of any kind, should only be permitted if they produce not the slightest distress, and even then within carefully defined limits, which will vary with each individual.

Sudden rupture or failure of compensation can often be traced to some indiscretion of this kind. Much greater restriction will be called for in middle or adult age, when the heart and arteries tend to impairment, than in youth, when the vascular tissues are sound. Occupations entailing great muscular effort or fatigue, or unduly long hours, or attended by exposure to injurious atmospheric conditions, such as ill-ventilated rooms, damp, or cold, should be avoided.

All emotional excitement, worry, and anxiety should be as far as possible avoided. We are often asked whether the subject of a compensated valvular lesion should marry. It is essential that each of the contracting parties should be informed of the facts. Subject to this, the answer turns very much on whether or not marriage is likely to involve any undue strain, physical or mental. To the woman, there is the special consideration of pregnancy and parturition. In our opinion the strain of pregnancy is nearly always harmful, although the ill effects are not always manifest at the time, and may not appear until a second or third or, exceptionally, an even later pregnancy: moreover, the severe strain of parturition is attended by grave risks, which are particularly frequent in cases of mitral stenosis. We cannot, therefore, close our eyes to the probable damage of childbearing. Excessive sexual indulgence is especially injurious.

The **food** should be plain, nourishing, and digestible, and not excessive in quantity; overfilling of the vascular system or over-distending the stomach with excess of food and drink is to be greatly deprecated. The habitual use of alcohol should be forbidden; tea and coffee should be taken only in very moderate amounts, and when they are noticed to cause cardiac excitement they should be avoided. Tobacco is apt to be injurious in these cases, and is best avoided, but if this is impracticable, its use should be reduced to a minimum. The occurrence of cardiac intermissions

in such patients may often be traced to the use of tea, coffee, or tobacco, and when these are left off they will disappear.

The subjects of cardiac valvular disease should avoid very cold baths, or swimming in the open sea or fresh water: the combination of shock and exertion is injurious. Very hot baths or Turkish baths are exhausting; but daily tepid sponging followed by friction of the skin is advantageous.

Constipation should be guarded against by the occasional use of gentle aperients, such as a mild aloetic or mercurial pill at night and a dram or two of sodium or magnesium sulphate the following morning.

A moderately warm, dry, and equable **climate** is that best suited to cardiac patients, where a fair amount of sunshine can be met with in winter, and where protection from damp and cold winds can be obtained. There is no objection, as a rule, to residence at even considerable altitudes, 3,000–5,000 feet.

It is not necessary to prescribe drugs in these compensated cases, so far as the valvular lesion is concerned. Neither digitalis nor iron is needed, and may prove injurious; but the coexistence of anæmia may call for the use of the latter. Arsenic is sometimes more beneficial in the anæmia of these cardiac cases. Sodium bromide is occasionally needed to allay the nervous disturbances which are not infrequently encountered in compensated mitral cases in women. Any intercurrent illness, such as influenza, should be treated with the fullest care; and in a rheumatic subject the least threatening of rheumatism should be promptly dealt with.

When, however, failure of compensation seems to threaten and the cardiac action tends towards irregularity and increased frequency, the long-continued use of some mild iron tonic is often of the greatest service. It may be combined with small doses of sodium or ammonium bromide.

In the next place we will review briefly the various morbid conditions which follow the *failure of compensation* in chronic valvular disease. And first we will consider the case of a **non-compensated lesion** of the **mitral valve.**

Whether the lesion be insufficiency and regurgitation, or stenosis and obstruction, the effect on the circulation will be much the same when compensation fails, but it is rare to find a serious obstructive lesion of the mitral without some coexistent insufficiency. In pure mitral stenosis it is through failure of the right ventricle especially that compensation is broken.

Tracing the effects of failure of compensation backwards step by step, we find that the over-full and dilated left auricle being unable to empty itself completely as usual into the left ventricle, an impediment to the outflow from the pulmonary veins arises, and, as the right ventricle is no longer able fully to overcome this, dilatation of the pulmonary vessels and engorgement of the lungs follow. This congestion of the pulmonary vessels and retardation of the blood current in them gives rise to imperfect aeration of the blood, and to respiratory dyspnœa, together with a tendency to hæmoptysis, as the over-distended vessels are apt to give way; and there is also a disposition to congestive bronchial catarrh, with cough and watery or sanguineous expectoration. Thus we see that the first symptoms that are liable to arise as the result of failing compensation are those due to passive pulmonary engorgement: dyspnœa, cough, expectoration, and sometimes hæmoptysis. At the same time the action of the heart becomes feeble, labouring, and irregular, and palpitation is complained of. The strain also makes itself felt on the right cavities of the heart, and the right ventricle yields to its excessive labour, the right auricle becomes over-distended, and the outflow of blood from the venæ cavæ and the systemic veins is hindered.

The liver and the other abdominal viscera feel this obstruction in the venous current, their vessels become over-filled, and the liver often becomes greatly enlarged. Hindrance to the portal circulation in the liver leads to congestive catarrh of the stomach and intestines, and pressure on the bile-ducts by the distended vessels within the liver gives rise to a subicteric staining of the skin, to a diminished discharge of bile into the intestines, and thus to constipation.

Distension of the renal veins and retarded circulation in the renal vessels cause scanty, high-coloured urine, which may contain albumin, casts, and blood-cells.

Evidence of obstruction to the circulation is seen in the superficial veins; they become distended and stand out prominently from the surface, the venules dilate, and the skin becomes cyanotic; general dropsy may then set in, beginning in the feet and ankles and extending upwards, usually affecting also the abdominal cavity, which is especially prone to ascites from the coexistence of obstruction to the portal circulation. Dropsy of the upper extremities and of the other serous cavities may supervene.

These are the chief morbid conditions which follow failure of compensation in mitral disease.

We see, then, that our therapeutic measures must be directed not only to raising the tone of the cardiac muscle, but also to the relief of the visceral congestions and to the removal of dropsical effusions; but it is clear that we cannot carry out the two latter indications unless we also succeed in fulfilling the former.

In cases of **aortic valve** disease, unless the mitral valve be also involved, as is not infrequently the case, failure of compensation is attended with somewhat different phenomena. Aortic insufficiency, although a more serious affection than the like lesion in the mitral, may through hypertrophy of the left ventricle remain for many years perfectly compensated, and may give rise to no morbid symptom. But when from degenerative changes in the hypertrophied

muscle, and a coincident sclerotic condition of the aortic arch and the orifices of the coronary arteries, compensation begins to fail, the following symptoms usually present themselves: Owing to the sudden emptying of the vessels of the head and face due to aortic regurgitation, great pallor of the face is often observed, together with symptoms of cerebral anæmia, headache, dizziness, swimming, and tendencies to faint, especially on any sudden alteration of position, as in getting out of bed, or rising suddenly from a reclining position. Palpitation may arise on the slightest exertion, and **pain** referable to the cardiac region is especially prone to occur in aortic cases with failing compensation. This pain may be limited to the cardiac region, but more commonly it radiates into the neck and down the arms and into the fingers, especially of the left side. Attacks of **angina pectoris** are frequently associated with this form of valvular lesion.

As failure of compensation progresses, painful attacks of dyspnœa are liable to occur, especially during the night, with orthopnœa. Although general dropsy is rare, some œdema of the feet is common; so also are pulmonary congestion and œdema with troublesome cough. Death is often sudden, but, as in mitral cases, is commonly the result of gradual cardiac asthenia. Symptoms due to embolism, cerebral, splenic, and renal, are frequent, as paralysis, hæmaturia, and splenic enlargement.

When mitral insufficiency is developed secondarily to aortic incompetence and stenosis, the series of morbid changes already described as dependent on mitral disease of course arises.

The primary **indication for treatment** in all these cases of ruptured compensation is to endeavour to relieve the exhausted energy of the cardiac muscle, and in many cases, especially those of mitral lesions, we are able to do so again and again. We have already pointed out the importance, in the treatment of cardiac diseases, of *diminishing the mechanical*

work of the heart. This is itself sufficient in many cases to restore the broken compensation. **Rest in bed,** with appropriate food, for two or three weeks, will frequently succeed in removing all the evidences of circulatory disturbance in chronic mitral disease. Cardiac irregularity, visceral congestions, dyspnœa, dropsy, will all disappear. Insist, then, as an essential condition of successful treatment, on physical rest, rest in the recumbent position, and maintain this rest for several weeks, if need be, until you have good reason for believing that a certain amount of compensation has been restored. With each breakdown of compensation there is progressive diminution of the working power of the heart, and this must be taken into account, in restricting exertion and enjoining rest, after temporary restoration of equilibrium. Much information may be derived from a careful study of the conditions under which breakdown has occurred.

Careful regulation of **diet** is a matter of prime importance: as a direct consequence of the circulatory stasis, the secretory and motor functions of both stomach and intestine are impaired, and there is a special liability to fermentation of food with gastric and intestinal flatulence. The total amount of the food must be restricted and duly apportioned to digestive capacity. The slow and enfeebled digestion will usually call for intervals of some four to five hours between meals, and a complete rest at night. In the absence of renal disease and high arterial tension, proteid foods should be given in excess of carbohydrates. They are less bulky, less liable to fermentation, and more stimulating. If for any reason a more liberal allowance of carbohydrates is indicated, it should be in the direction of those that are relatively poor in starch. For this reason dry crisp toast, pulled bread, and rusks, in which the starch has already been partly transformed, are preferable to bread. While laying down these general rules, we should not push them to the disregard of individual idiosyncrasies or fancies.

Fluids also must be restricted: many patients will be satisfied with a total daily amount of no more than 10 ounces, and this is best taken in divided portions one hour before each of the three regular meals. Sometimes a glass of red wine at mealtime may be needed to stimulate appetite and promote digestion.

But we have at our disposal some very reliable medicinal resources for raising the tone of the cardiac muscle when it begins to fail, and these are the various drugs known as cardiac tonics, which we must now pass in review.

Of all cardiac tonics **digitalis** remains the most reliable and trustworthy. Its power of restoring tone to the enfeebled cardiac muscle is remarkable, and is unequalled by any other drug. Under its use the systolic contraction of the ventricles becomes more vigorous, the period of diastole is prolonged, and the pulse, at the same time, becomes slower and more regular as well as stronger. The prolonged diastole causes better emptying of the veins, and the stronger systole better filling of the arteries. In mitral regurgitation the improved tone of the right ventricle raises the pressure in the pulmonary veins and the left auricle, and counteracts the backward flow through the incompetent valve, and the more vigorous and complete contraction of the left ventricle causes a larger quantity of blood to be projected into the arterial system. Digitalis also acts as a tonic to the arteries, stimulating normal contraction of their muscular fibres, and so, by calling into play a healthy resilience, furthers a steady and continuous flow of blood onwards through the capillaries. The combined action of digitalis on the heart and arteries is manifested also in copious diuresis, to which we shall have to refer hereafter. Although the constriction of the arterioles increases the resistance against which the heart has to work, this is more than counterbalanced by the increase of power afforded to the heart.

It is this twofold tonic action on the forces of

the circulation that is so valuable in digitalis, for the tonic contraction of the peripheral vessels is an important aid to the circulation, and is especially felt in the capillaries and the venous radicles ; hence it is that digitalis acts so powerfully in the relief of cardiac dropsies, and often so largely increases the flow of urine. Prof. H. C. Wood has shown how digitalis aids the nutrition of the heart itself : first, by completely emptying the vessels of the heart during the sustained and strengthened systolic contractions ; and, second, by promoting the more complete filling of its arteries during the prolonged diastole, and at the same time affording the necessary rest to the cardiac muscle, Hence the permanent improvement following its use.

A few days' administration of digitalis combined with rest in bed will often reduce the cardiac beat from 120 or 130 to 60 or 70 in the minute.

Digitalis should never be administered until the veins have been unloaded, and the chambers of the heart unburdened, by the action of a brisk purgative. This involves no loss of time, as the influence of digitalis is not felt in the heart until some thirty-six hours have elapsed, giving abundant time for the more rapid action of appropriate laxatives. In urgent cases of cardiac failure a preliminary venesection may be indicated.

In the advocacy of substitutes for digitalis, now so common, a great deal is often made of the so-called drawbacks and dangers attending its use. It is said to accumulate in the system, and after a time to produce sudden dangerous symptoms. After a long and considerable experience of its use in cardiac disease we have rarely met with such a circumstance. That it occasionally causes gastro-intestinal irritation, especially if administered unskilfully, or in too large doses, or for too long a period, is certain. But with care in its administration—*and all drugs should be administered with care*—and occasional interruptions in its use, it will be found suitable for all but a very few exceptional patients.

In the palpitation not infrequently encountered in cases of mitral stenosis in women without other signs of failing compensation, digitalis will often produce distressing symptoms, even in small doses. One patient described its effect as making her feel "as if her heart was grasped in the hand." In such cases, if digitalis is given, the pulse may become small and irregular and the urine scanty. It is now generally admitted that this drug rarely acts well in cases of uncomplicated mitral stenosis. But when there is regurgitation as well, and the stenosis is not of high degree, excellent results ensue.

Some importance must be attached to the choice of a suitable preparation of the drug and to its administration in suitable doses. The preparations usually employed are the powdered leaves, the tincture, and the infusion, and also *digitalin*. The powder is especially prone to cause gastro-intestinal irritation, and should be avoided. Pilules of digitalin will be found useful and convenient in the slighter functional cardiac disturbances, but it has not the diuretic action of digitalis leaves. Of the several digitalins manufactured, the crystalline form of *Nativelle* is the most potent—it is said to consist almost entirely of digitoxin—the dose is from $\frac{1}{250}$ to $\frac{1}{60}$ grain. One of these granules is roughly equivalent to 15 minims of the tincture.

Hypodermic injection of digitalin—one or two of Savory & Moore's discs of $\frac{1}{100}$ grain at a dose—has been recommended, when a speedy response is demanded: in such circumstances we should prefer to inject strophanthin (p. 382). An objection to hypodermic administration is the difficulty of avoiding local irritation, even with carefully selected preparations. There remain the tincture and the infusion; the former is a handy and useful preparation, but a great many physicians prefer the freshly prepared infusion. Both the tincture and the infusion, if fresh, contain active digitoxin, the former in solution, the latter in suspension: it is a matter of small importance which

of these preparations we employ. Then as to the best dose. In cases where it is important to establish the diuretic action of the drug as quickly as possible, we should begin with full doses, which we can diminish when full diuresis has been established. Half an ounce of the infusion, or 20 to 25 minims of the tincture, combined with a dram of the spirit of juniper, may be given every six hours until the diuretic action of the drug has been produced. Diuresis usually sets in on the third or fourth day of administration.

In cases where there is no dropsy, smaller doses, which may be continued for a considerable period, act better, and we frequently give doses of 10 minims only of the tincture or a dram or two of the infusion three times a day. If there is any tendency to gastric irritation, it is as well to combine with these small doses 20 or 30 minims of the aromatic spirits of ammonia and some aromatic water. When there is great gastric disturbance, digitalis has been given by the rectum in the form of small enemata; an ounce of the infusion with 2 ounces of warm water may be thus administered twice or three times a day. Digitalis should always be gradually withdrawn by progressive diminution of doses.

When digitalis fails, it is usually because the cardiac muscle is in an advanced stage of degeneration; then, indeed, it is useless, and its administration should not be continued.

Huchard has pointed out that children bear digitalis well because of the integrity of all their organs, but, being a toxic drug, it should be given to them cautiously and in small doses; whereas old people bear it badly owing to the probable presence of lesions of the cardiac muscle and of the blood-vessels, as well as of the kidneys and liver; to them it should be given, therefore, also with great caution, especially when there exist obvious signs of *arterio-sclerosis*. If digitalis is used it should be given in small doses along with such a vaso-dilator as liquor trinitrini.

We have already said that this drug is counter-indicated in many cases of mitral *stenosis*, and should only be given with great caution and when there are symptoms of failure of the right ventricle. Broadbent points out that "in mitral stenosis the blood cannot be forced through the constricted mitral orifice beyond a certain rate of speed, and if the right ventricle is stimulated to contract more than is required for this, it encounters an insuperable obstruction and becomes embarrassed in its action, its energy being needlessly expended. A common result is irregularity in the beats, accompanied by a sense of præcordial oppression."* But when the action of the heart is feeble, rapid and fluttering, a few doses of digitalis will often prove of service, if the embarrassed circulation has been previously relieved by establishing and maintaining free action of the bowels.

Next, perhaps, in value to digitalis as a cardiac tonic we must reckon **strophanthus.** It is a direct stimulant of the cardiac muscle, and not only does it, like digitalis, regulate the cardiac rhythm, slow the pulse, and strengthen and sustain the ventricular systole, but in some cases it also, like digitalis, acts as an efficient diuretic; and, in our own experience, it is often in those cases in which digitalis fails to act as a diuretic that strophanthus succeeds. Complaint has been made of the uncertainty of its action, and it must be admitted that it is not to be so generally relied upon as digitalis, especially in serious failure of compensation. But in cases of cardiac feebleness, with rapid pulse, associated with corpulency, flatulence, and dyspepsia, or following acute illnesses, we have found it, in some cases, most useful and much better tolerated than digitalis. This drug is also useful as a substitute for digitalis when we think it necessary or desirable to suspend for a time the administration of the latter; and we shall sometimes find that when we have, as it were, exhausted the sensitiveness of the cardiac muscle to digitalis

* "Heart Disease" (3rd edit.), p. 134.

it is a good plan to resort to strophanthus, and return, after a time, to digitalis. The fact that strophanthus is more exclusively a *cardiac* tonic, and exerts a feebler action on the arterioles than digitalis, seems to point to it as the better drug of the two in gout and other cases in which vascular tension is high from contracted arterioles.

The action of strophanthus is not cumulative like that of digitalis, nor have we found, in small or moderate doses, that it produces, as has been stated, gastric or intestinal irritation. As to the best dose and preparation, we have found from 10 to 15 minims of the tincture every four to six hours answer well.

A more rapid effect may be obtained by subcutaneous administration of strophanthin, not exceeding $\frac{1}{500}$ grain until the effect of this dose has been ascertained.

Squill exerts an influence even more powerful than that of digitalis in strengthening systole and prolonging diastole, and in addition is a powerful diuretic. It is, however, inferior to digitalis in that it is more toxic and more liable to irritate the stomach and intestine. At the same time there are not a few cases in which it is a most effectual cardiac tonic. The tincture in doses of 5–15 minims, and the syrup in doses of half a dram or a dram, are both reliable preparations.

A valuable, though less reliable, cardiac tonic, the use of which had, until lately, been somewhat neglected in Great Britain, is **caffeine**; and in some cases of cardiac failure its administration by hypodermic injection,* especially when from the existence of gastric disorder other cardiac tonics cannot well be given, is often attended with remarkably good results. It is to the modern French school of physicians that we chiefly owe the advocacy of caffeine

* For this purpose, as well as for internal use, caffeine can be dissolved in sodium benzoate or salicylate in the following proportions: Caffeine, 30 grains; sodium benzoate, 35 grains; distilled water to make 200 minims. An injection of 20 minims will contain 3 grains of caffeine.

as a cardiac tonic. Experiments on animals have given rise to the most conflicting opinions as to its action on the heart and circulation. This is due to the fact that caffeine stimulates both the vaso-motor centre and the heart muscle itself. The former produces constriction of the arterioles with rise of blood pressure and a tendency to slow the heart, while the latter increases both the rate and the force of the heart. Thus the rise of blood pressure and increased power of the heart are constant factors, while the influence on the rate of the heart varies with different individuals, according as the central or peripheral action predominates. In some it will cause rapid cardiac action; in others it will slow the pulse, and cause cardiac intermissions distinctly sensible to the patient himself. It is to clinical experience, therefore, that we must refer for guidance in the use of this drug as a cardiac tonic. Dujardin-Beaumetz taught that it is "especially in the last stage of cardiac disease, at the period of *asystole*, and when we have exhausted the effect of other cardiac tonics, that caffeine will be found of signal service." He also maintained that it has often been given in insufficient doses, and that as much as 30 grains a day must be given in order to obtain the best results. The diuretic action of caffeine is more certain and often more powerful than that of digitalis, owing to a direct action on the kidneys as well as the indirect influence of a heightened blood-pressure. In exceptional instances caffeine fails to increase the flow of urine, probably because the central action on the vaso-motor centre, producing vaso-constriction of the renal artery, outweighs the peripheral direct action on the kidney, with its associated tendency to vaso-dilatation of the renal artery.

Caffeine may also be usefully combined with digitalis, the combination producing diuretic effects superior to what can be obtained from either given alone. Some prefer the sodio-salicylate of theobromine to caffeine, as having a stronger diuretic

action, and not causing nervous agitation and sleeplessness, which caffeine is apt to produce by stimulating, like strong coffee, the central nervous system. This is the preparation known as *diuretin*. The dose is 15 grains every four hours.

Convallaria and the glucoside *convallamarine* have been employed as cardiac tonics, and no doubt they possess in slight degree the property of augmenting the contractile force of the heart, and so promoting diuresis. They are, however, greatly inferior to the preceding, and their use should be reserved to certain cases in which these do not agree, or where, for some reason, it seems desirable to vary the treatment. A tincture of convallaria is made, of which the dose is 5 to 20 minims, three to six times a day, or convallamarine may be given in $\frac{1}{2}$-grain doses twice daily.

Sparteine has been employed as a cardiac tonic, but in our opinion without any justification whatever. In some cases there is a rise of blood-pressure of very short duration due to constriction of the arterioles; this, however, soon yields to a fall of pressure due to depression of the heart. Nor has sparteine any diuretic action; and scoparin, not sparteine, is the diuretic principle of scoparius. Sparteine is usually given in the form of sulphate, 1 to 2 grains three times a day.

Adonis vernalis and a glucoside derived from it, *adonidin*, have also been given as cardiac tonics, the latter in doses of $\frac{1}{6}$ to $\frac{1}{3}$ grain; but little reliance can be placed on them.

Cactus grandiflorus is a cardiac tonic recently introduced as possessing the power of regulating and strengthening the cardiac contractions in organic and functional cardiac affections, especially the latter, but, like the preceding, it appears to be unreliable.

Strychnine, quinine, coca, kola, are all cardiac as well as general tonics, and they find their proper use in cases of cardiac dilatation associated with general muscular and nervous asthenia.

They appear to have little or no direct special action, like digitalis or strophanthus, on the cardiac muscle, but they act rather through their general tonic influence on the nervous centres; they are none the less valuable on that account, and we have found strychnine, quinine, and coca of the very greatest use in the treatment of cases of cardiac asthenia following acute disease; but they cannot take the place of digitalis and its analogues for the purpose of regulating cardiac rhythm and promoting diuresis in grave cases of valvular disease with failure of compensation. They should rather be used as adjuvants to these drugs. In urgent cases of cardiac failure strychnine in small frequent subcutaneous doses is a very valuable remedy.

There are few cases of chronic valvular disease with failing compensation that will not, at some period in their course, be greatly benefited by the judicious administration of some preparation of **iron.** The milder preparations usually answer best, such as the ammonia citrate, the phosphate, and the tartrate. The attention of medical practitioners has been so strongly directed of late years to other cardiac tonics that the value of ferruginous compounds is in danger of being overlooked, and it is necessary, therefore, to insist on their undoubted value and efficacy. They may often be combined advantageously with arsenic.

In mitral cases, accompanied with symptoms of arterial obstruction, as in chronic Bright's disease, it is often advisable to combine with the cardiac tonic, such as digitalis, an arterial relaxant, such as sodium iodide, nitro-glycerine, or erythrol nitrate. The sphygmomanometer is often of the greatest value in recording variations of blood-pressure, as a guide in treatment.

When at last we have succeeded in restoring lost compensation, we must be careful to relax treatment gradually and cautiously. Rest should be modified at first only to the extent of sitting in an arm-chair for increasing periods, and if possible in the open air.

After this gentle walks on level ground may be allowed, and the length increased as the state of the heart indicates. Walking upstairs or uphill should be forbidden until the last vestige of disturbed circulation has disappeared. It is at this stage that benefit may often be derived from a course of Nauheim baths, at the spa or at home, with or without carefully graduated resistance movements. We shall have occasion to consider the details of this treatment in a later chapter.

ADDITIONAL FORMULÆ

Cardiac tonic powders

℞ Pulveris digitalis, gr. iij.
Quininæ sulphatis, gr. xviij.
Pulveris rhei, gr. xviij.
Sodii bicarbonatis, gr. xviij.
M. et divide in pulv. x. A powder twice a day.
(*Schnitzler.*)

Cardiac tonic mixture

℞ Infusi adonis vernalis (made by infusing 60 grains of the leaves in 4 oz. of water), ʒiv.
Spiritus menthæ piperitæ, ♏v.
M. f. mist. A tablespoonful four times a day. (*Schnitzler.*)

Iron and digitalis cardiac tonic

℞ Tincturæ digitalis, ♏clx.
Tincturæ ferri perchloridi, ʒiij.
Spiritus chloroformi, ʒiij.
Glycerini puri, ʒj.
Aquæ destillatæ ad ʒiv.
M. f. mist. A teaspoonful in a wineglass of water four times a day, after food. (*Whitla.*)

Cardiac tonic

℞ Syrupi floris aurantii, ʒiv.
Infusi convallariæ majalis (made by infusing 2½ drams of the plant in 12 oz. of water) ad ʒvj.
A tablespoonful every two hours. (*Bamberger.*)

Sedative drops to allay cardiac excitement

℞ Extracti belladonnæ, gr. iij.
Tincturæ digitalis, ʒijss.
Aquæ laurocerasi ad ʒj.
M. f. mist. Ten drops three times a day. (*Schnitzler.*)

Subcutaneous injection for acutely dilated heart

℞ Adonidin, ¾ gr.
Aquæ destillatæ, ½ oz.
Inject 1 to 2 c.c. subcutaneously.

Caffeine mixture

℞ Caffeinæ, gr. xvj.
Sodii benzoatis, gr. xvj.
Syrupi floris aurantii, ʒiij.
Aquæ ad ʒiv.
M. f. mist. A tablespoonful for a dose.

CHAPTER XVII

MANAGEMENT OF SPECIAL SYMPTOMS DEPENDENT ON CHRONIC VALVULAR DISEASE

Symptoms due to Venous Engorgement—*Treatment*—Bleeding—Purgatives—*Treatment* of *Dyspnœa*, of *Bronchial Catarrh* and *Cough*, of *Hæmoptysis*, of *Dyspeptic Symptoms*, of *Dropsy*—Diuretics—Dechloridation—Diaphoretics—Incisions into Subcutaneous Tissue—Multiple Punctures—Paracentesis Abdominis—Massage and Movements—*Treatment* of *Restlessness and Insomnia*—Caution in Use of Opiates—Codeia—The Bromides — Sulphonal — Paraldehyde — Camphor — *Treatment* specially appropriate to *Aortic Lesions*—Food and Regimen—Digitalis—Consequences of Hypertrophy—Arterial Strain—Anginal Attacks — Symptoms due to Cerebral Anæmia, to Hypertrophy, to Embolism—Value of Rest—Avoidance of Excitement, Physical and Mental—Food and Stimulants—Gentle Aperients—Digitalis—*Treatment* of *Attacks of Pain*—Potassium Iodide—Nitro-glycerine—Opium and Morphine and Oxygen for Dyspnœa and Insomnia. Additional Formulæ. Exercises for Cardiac Patients confined to Bed.

In the present chapter we will consider the appropriate treatment of the several morbid conditions which arise in consequence of the breakdown in the cardiac mechanism from failure of compensation.

In the first place there are the symptoms referable chiefly to the pulmonary engorgement—dyspnœa, cough, hæmoptysis ; and secondly those due to the over-distension of the right side of the heart, and the systemic and portal veins—cyanosis, gastro-intestinal catarrh, jaundice, albuminuria, and general dropsy. We must not allow the prominence of the local symptoms in the lungs or elsewhere to divert our chief attention, in applying remedies, away from the heart.

Now some of these conditions may be relieved by diminishing the volume of blood in the right side of the heart and in the veins, so that their over-distension is lessened, together with the pulmonary engorgement.

We may diminish the volume of blood directly by the abstraction of blood by **bleeding**, or indirectly by the withdrawal of water from the blood by means of hydragogue purgatives.

If the right ventricle retains a fair amount of contractile power, as evidenced by a forcible right ventricular impulse, the relief of its over-distension by the abstraction of 6 to 10 ounces of blood is often very remarkable.

Bleeding should be reserved for the relief of cases of intense dyspnœa with cyanosis, arising from a great amount of backward pressure and over-distension of the right side of the heart with pulmonary engorgement; it should be immediately followed by cardiac stimulants and tonics, and it should rarely exceed 10 ounces at a time. It is chiefly useful in enabling restoratives and tonics to act more efficiently, and it is more likely to answer well in young and robust subjects than in the old and debilitated; in the latter it will rarely prove a judicious expedient. By postponing for a short period the fatal event, it may, however, prove a valuable measure in enabling the patient to transact important business, which would otherwise be left undone.

We may mention a case in point, in which the abstraction of a few ounces of blood (4 or 5) led to the most astonishing revival of a cardiac patient who was on the point of death. She was relieved of her breathlessness, and began to eat and drink again with appetite, and to converse cheerfully. Besides aortic obstruction and regurgitation, she had evidences of mitral stenosis and regurgitation, and on post-mortem examination the tricuspid valve was also found to be diseased, and there was immense distension of the right auricle, which the bleeding had relieved. The revival, however, only lasted for about a fortnight.

Sometimes the application of 6 to 10 leeches over the liver in the epigastrium may suitably take the place of venesection.

There are few cases of heart disease, with notable

venous obstruction, that are not greatly relieved, at some part of their course, by the administration of suitable **purgatives.** Purgation, in fact, should go hand in hand with stimulation of the heart; and to be effective, it must be free.

The unloading of the portal system thus induced tends directly to the removal of the congestion of the liver and the concomitant gastro-intestinal catarrh, and so assists in the assimilation of food, while it indirectly relieves the distension of the right side of the heart, the overloaded systemic veins, and the pulmonary congestion; ascites and general dropsy may be also greatly diminished, if not completely removed.

The purgative should be given in the early morning, when the stomach is empty, so as to avoid any disturbance of the patient during the night, and to sweep away the débris of food only, and not to imperil the nutrition of the patient.

We usually select, when there is ascites, either saline purgatives, such as *magnesium sulphate*, or hydragogue cathartics, such as scammony, jalap, gamboge, senna, and elaterium.

A full dose of magnesium sulphate (3 to 6 drams) dissolved in as small a quantity of water as possible should be given in the morning, fasting: 10 drops of the B.P.C. tinctura zingiberis fortior will cover the taste, and exert a carminative effect.

The *compound jalap powder* of the B.P. is a favourite purgative in these cases; from 30 to 60 grains may be given every morning. The compound scammony powder is also a useful purge. It may be given alone in 15- or 20-grain doses or combined with the compound jalap powder; or we may give 10- or 15-grain doses of a combination of equal parts of the compound colocynth and compound gamboge pill. We should reserve *elaterium* for cases in which the preceding fail, or do not cause a sufficient discharge of fluid from the bowels. It varies a good deal in its activity, and is sometimes very depressing. The

compound powder of elaterium may be given in 3-grain doses. A little ether, or sal-volatile, or brandy, should be given if much depression attends its action.

In cases where these strong cathartics are not needed or are ill borne—and it is only in cases complicated with dropsy that they are needed—milder ones should be resorted to, such as the compound liquorice powder, Carlsbad salts, or colocynth and henbane pills. The cardiac patient should never be allowed to become constipated, as constipation raises the tension in the abdominal vessels, and augments the work of the heart. As a rule these patients bear purgatives well.

A good and gentle aperient for habitual use in these cases is a pill of a grain of calomel and 5 grains of rhubarb at night, and 1 or 2 drams of sodium sulphate in a wineglassful of hot water the morning following.

Additional measures may be needed to relieve the **dyspnœa, hæmoptysis,** or **bronchial catarrh,** with cough and expectoration, dependent on the pulmonary congestion. In the severer grades of respiratory distress the posture of the patient must be carefully regarded. His own inclination will have led him to adopt the position in which he can draw his breath at the greatest mechanical advantage: we find him orthopnœic. Our aim should be to enable him to maintain this posture with the least expenditure of effort. Every physician knows how difficult a matter it is to prop a patient in bed; the oblique axis of the body, supported as it is only by "skin-friction," tends to constant slipping from the point of support towards the foot of the bed, with consequent rucking of the sheets and general discomfort that needs repeated correction. This can be readily overcome by inserting a stiff bolster beneath the mattress across the bed, under the thighs, so as to form a double inclined plane. With some patients the desire to have the legs below the level of the body is so strong that by no contrivance can they be

kept comfortably in bed. Such patients find much relief in the time-honoured **heart-chair** with its movable leg- and head-rests.

Of medicinal agents, in addition to our tonic and eliminant measures, a combination of liquor strychninæ with spirit of ether will usually prove serviceable. If a rapid effect is imperative, either of these drugs may be given subcutaneously, and periodic inhalations of oxygen may be tried. Dry cupping over the back of the chest, or a large mustard leaf to the base of each lung in succession, is sometimes useful.

When the dyspnœa is due to over-distension of the pulmonary vessels, as it usually is, temporary relief may often be obtained by administration of the nitrites, nitrite of amyl, nitro-glycerine, or sodium nitrite, as they cause a temporary dilation of the vessels of the lungs.

Hæmoptysis, which is especially liable to occur in mitral stenosis, does not call for any active interference for its arrest unless it is excessive or dangerously prolonged. Its effect must be to unload the pulmonary vessels and to relieve the congestion which has induced it. Osler mentions a medical man who had many attacks of hæmoptysis in association with mitral incompetence, and whose condition was invariably better after the attack. As, however, the symptom is usually an alarming one to the patient and his friends, they should be told that its effect is sometimes salutary; and at the same time some simple remedies may be prescribed. Perfect repose must, of course, be insisted on, and a few doses of magnesium sulphate will help to lower the blood-pressure. Nervous agitation and palpitation must be allayed by some sedative, and for this purpose we may give a dose of $\frac{1}{6}$ or $\frac{1}{4}$ grain of morphine with a dram of cherry-laurel water.

In the treatment of the **cough** of cardiac cases we should follow much the same methods as in the

treatment of chronic bronchial catarrh (*see* Chap. XXV.), but in cardiac cases expectoration may be promoted and the cough relieved by stimulants directed to help the struggling heart, such as ammonium carbonate, with spirits of ether or chloroform, nux vomica, and senega; as a drink, hot milk with Apollinaris water (equal parts), and a few teaspoonfuls of brandy, may be given. Stimulating expectorants, combined with small doses of opium, have a good effect, such as the ipecacuanha and squill pill of the B.P., 5 grains once or twice a day; or a linctus of heroin may be given from time to time.

The **gastric** symptoms dependent on congestion of the liver (which is often greatly enlarged) and engorgement of the portal venous system, such as loss of appetite, flatulence, nausea, and vomiting, are often very difficult to relieve. All that has been said in the previous chapter on the subject of diet will now be doubly applicable.

It is well to begin by giving non-irritating and non-depressing aperients. Half a grain or a grain of calomel with 3 grains of colocynth and henbane pill may be given every night, and 1 or 2 drams of sodium sulphate and ½ dram of sodium bicarbonate in an ounce or two of hot water the first thing in the morning. For the nausea, repeated dram-doses of liquor bismuthi, undiluted with water, with a drop or two of dilute hydrocyanic acid in each dose, may be given. Large hot linseed and mustard poultices over the right hypochondriac and the epigastric regions frequently afford great relief. The flatulence will be relieved by a grain of menthol or thymol or ½ minim of creasote in a pill twice or three times a day after taking food. Obstinate vomiting will require the suspension of all food except a little iced milk or milk and lime water. Small quantities of iced water, or effervescing drinks, such as iced champagne with Apollinaris water, may be given to allay thirst and to support the patient. Occasionally the stomach is intolerant of even the

smallest quantities of fluid food. Then we are left with no alternative but the temporary resort to simple saline or nutrient enemata, until gastric irritability is relieved and flatulent distension has subsided. We have known the subcutaneous injection of $\frac{1}{4}$ grain of morphine give relief, when all other expedients had failed, but this is a measure to be adopted only with keen circumspection.

Digitalis is usually very badly borne in cases of this kind, but we can sometimes give nux vomica with advantage after the vomiting has been checked. Fifteen to 20 drops of the tincture combined with 10 or 15 grains of sodium bicarbonate should be given three or four times a day when the stomach is empty.

Much care must be observed in feeding these cases of great gastric irritability. The food should be fluid or semi-fluid, in small quantity, and predigested. Peptonised milk, or beef and chicken jelly, or peptonised gruel or cocoa, occasionally a cup of clear soup, all these may be used so as to vary the dietary.

But one of the most urgent symptoms which we have to treat in connection with venous engorgement from failure of compensation is **dropsy**, and we will now consider in detail the best measures to adopt in order to relieve the dropsy of cardiac disease. The use of purgatives and of cardiac tonics for this purpose we have already referred to.

The removal of the serous fluid which has accumulated in the subcutaneous connective tissue, or in the serous cavities, may be effected in various ways: (1) It may be removed by excessive diuresis through the agency of the kidneys; (2) it may be drained away from the intestinal vessels by hydragogue cathartics; (3) it may be drained off by direct puncture or incision of the skin and connective tissue, or, if the serous cavities are involved, by puncture and aspiration. (4) Removal may be promoted by massage, movements, and by certain modifications of diet. (For scheme of exercises suitable for a cardiac patient confined to bed, *see* Appendix to this chapter, p. 409.)

Most of those drugs which we have described as cardiac tonics act also as **diuretics.** They raise the blood-pressure in the renal glomeruli by strengthening the cardiac contractions, and while they thus increase the flow of urine, they at the same time tend to remove the cause of the dropsical effusions. We usually, therefore, commence the treatment of cardiac dropsy by the attempt to excite excessive diuresis, and for this purpose we administer those drugs which act also as cardiac tonics. The diuretic effect of *digitalis* is sometimes most remarkable, and it is common to see a considerable amount of general anasarca disappear in a few days with rest in bed and treatment with digitalis. The fresh infusion of the leaves is reputed to be the preparation which has the most powerful diuretic effect. We should begin by giving a full dose, such as ½ ounce, three times a day, and diminish the dose as the diuretic effect becomes established. This is a better plan than to lose time by beginning with an inefficient dose and gradually increasing it. The only caution necessary is that the drug should not be allowed to accumulate in the system; and this it certainly cannot do at the commencement of its use. If digitalis fails, *strophanthus* may be tried in 5- to 10-minim doses of the tincture every three or four hours; this drug will, in certain cases, cause free diuresis after the failure of digitalis. *Caffeine* may next be tried: its diuretic power is often very considerable. It may be given in 3- to 6-grain doses four or five times a day, either by the stomach, dissolved in water with the aid of sodium benzoate, or by hypodermic injection. The other cardiac tonics may be tried if these fail.

It is customary to combine squill with digitalis as forming a more effective diuretic than either singly, and the addition of blue pill or calomel to a pill containing squill and digitalis has long been a favourite formula. *Calomel* itself promotes diuresis in some cases of cardiac dropsy, and its employment is indicated when the class of cardiac tonics fails, or to

aid them when they prove inefficient. It sometimes acts rapidly; its diuretic action is somewhat difficult to explain, but it is probably due to its purgative action relieving œdema of the kidney, and so promoting a freer renal circulation. It has been given, in these cases, in doses of 1½ to 3 grains, three or four times a day. Its use should not be continued after its diuretic effect has been established. It should not be given in advanced cases.

Potassium iodide often proves a serviceable diuretic, alone or in combination with digitalis.

Diuretin (sodium theobromine salicylate) has been advocated as a valuable diuretic in cardiac dropsies. In some cases its diuretic effect is remarkable, leading to the rapid absorption and elimination of copious dropsical fluid; at the same time it is not pretended that it can take the place of digitalis. It is given in doses of 15 grains in water every four or five hours. It is said to be a very unstable preparation, and readily to decompose, and this fact may account for the conflicting estimates of its value that have been published.

It is often found that a combination of diuretics will answer better than either alone. We have sometimes observed great benefit from a combination of diuretin with digitalis. Some of the most useful of these combinations will be found amongst the formulæ at the end of this chapter.

The effect produced by diuretics will depend on the condition of the heart and the kidneys. If the cardiac muscle is in a state of advanced degeneration, and if the kidneys are also unsound, very little good can be expected of them.

We must here briefly refer to the so-called **dechloridation** treatment of dropsy, based on the belief that common salt taken in excess of the excretory power of the kidneys leads to retention of water in the tissues. In the case of the cardiac kidney, as well as in the various forms of Bright's disease, the power of the kidney to excrete common

salt is as a rule diminished. Practically speaking, an adequately salt-free diet may be obtained by prohibiting the use of salt in the preparation of the food, and by instructing the patient to take none with his food. The treatment in our experience has a limited usefulness, but there is no doubt of its benefit in some cases: the salt-free diet may be alternated with periods of exclusive milk diet.

When diuretics fail to relieve the dropsy, recourse is had, in the next place, to those hydragogue cathartics the use and application of which we have already described; and it often happens that, after a certain amount of the dropsical exudation has been removed by the action of these drugs, diuretics will be found to have recovered their power, and may be re-administered with advantage.

Serviceable as **diaphoretic** measures prove in the treatment of renal dropsies, they are too exhausting for free use in the removal of those of cardiac origin, and when diuretics and cathartics fail us we have only one other resource left, viz. to drain away the dropsical fluid by punctures or incisions into the subcutaneous tissue; or, in dropsy of the peritoneum or other serous cavities, to remove the fluid by paracentesis.

These measures are often needed in the last stage of heart disease to relieve the distress of the patient from the enormous swelling of the legs, which may become quite immovable, or from the great accumulation of fluid in the abdominal cavity preventing the descent of the diaphragm. It is remarkable the relief that is afforded by these measures in some cases, and, when accompanied or followed by appropriate tonic and supporting remedies, the patient is occasionally restored for a time to comparative comfort.

There are different methods of effecting this drainage. Some make free **incisions** half an inch to an inch in length through the skin and subcutaneous tissue over each malleolus; the legs are kept in a

dependent position, and the patient's body is raised into the sitting or semi-recumbent attitude. Large quantities of fluid will thus be drained away, to the great relief of the patient. Most careful antiseptic precautions must be observed in the performance of this operation; the skin must be cleansed by washing it with soap and then with an antiseptic solution, and after the incisions have been made, the legs must be wrapped in flannel soaked in antiseptic fluid. Without such minute care, and in some cases in spite of it, owing to the low vitality of the skin, inflammation and sloughing will attack these wounds.

Less risk unquestionably attaches to **multiple punctures,** made with the same antiseptic precautions, with an angular surgical needle, thoroughly cleansed by being passed through the flame of a spirit-lamp, and also dipped in antiseptic fluid. Or short superficial linear scarifications, not deep enough to draw blood, may be made with the point of a scalpel. The patient should be seated, when practicable, in an easy reclining chair, with the legs dependent so as to intensify their swelling, and from 15 to 20 punctures should be quickly made around the ankle and on the dorsum of the foot. Fluid will usually flow rapidly from these punctures. The legs should then be enveloped in antiseptic wool or other appropriate antiseptic dressing, which will require frequent changing as it becomes saturated with fluid. Small multiple punctures or scarifications thus made and carefully treated usually heal readily.

Some recommend the use of what are called "Southey's tubes," small perforated silver cannulæ, which are introduced through the skin into the subcutaneous tissue, and attached to a length of fine indiarubber tubing, through which the fluid may be conveyed away into a suitable receptacle. These are intended to avoid the discomfort and trouble attending the continued escape of large quantities of fluid from the patient's legs, especially when he is confined to bed and cannot sit up; but with the

greatest care it is difficult to avoid septic contamination.

In some cases of cardiac dropsy a large accumulation of fluid occurs in the peritoneal cavity, embarrassing the respiration and circulation by pressing up the diaphragm, seriously interfering with the renal functions by pressure on the kidneys, and, by compressing the abdominal veins, further retarding the return of blood from the lower extremities. In these cases of cardiac ascites, when other measures, such as we have described, fail to make any impression on the amount of fluid, and serious consequences threaten from the pressure it is causing on surrounding parts, **paracentesis abdominis** should be performed for the removal of at least a portion of the fluid; firm pressure should also be applied to the external surface of the abdomen by a flannel binder both during and after the withdrawal of the fluid. Some diffusible stimulant should be given to the patient before the operation. It will often be found that when the pressure of the ascitic fluid is removed from the kidneys and the abdominal veins the action of diuretics and purgatives may be re-established, to the great advantage of the patient.

When there is much œdema of the abdominal wall along with ascites, it is apt to interfere with sealing of the abdominal puncture. In these cases the feet should be drained first, and the drainage will frequently be found to remove both anasarca and ascites.

Passive effusions into one or other pleural cavity (*hydrothorax*), when of sufficient amount to interfere seriously with respiration, must be removed, at any rate in part, by puncture and aspiration.

Massage has been applied successfully to relieve the œdema of the extremities, and also the ascites of cardiac disease when not too far advanced. The tendency to stasis in the venous capillaries is remedied to some extent, and the return of venous circulation promoted, by suitable manual compression and strok-

ing of the surface as in massage. Massage of the extremities may be accompanied by abdominal massage, and in suitable cases gentle resisted movements may also be employed. Diuresis may be thus established, and the œdema of the feet and legs, in the early stages, may often be caused to disappear; but less effect is observed to follow when there is much ascitic fluid in the abdominal cavity, doubtless because in these cases the cardiac failure is more serious, and the lesion less remediable.

The **cerebral congestion** dependent on venous stasis in advanced mitral disease may be attended with various unpleasant symptoms, none, however, more distressing to the patient than the restlessness and insomnia it sometimes induces. There is much difference of opinion as to the propriety of administering opium or morphine in these cases, and to use it safely requires, in our opinion, the greatest skill and discrimination. We would urge the utmost care in the hypodermic use of morphine in these cases on account of the rapidity with which the drug is then absorbed. We prefer to give it as a suppository. The effects are so remarkable in some cases in producing a calm, refreshing sleep, that opium seems to be then deserving of a place among cardiac tonics. There is no denying that in rare instances the end has been accelerated by morphine, but far more often by the fear of morphine. In conditions of urgent cardiac distress, with restlessness and insomnia, patients are too often allowed to die of sheer exhaustion for want of sleep. It is idle then to put one's trust in hypnotics other than opium or morphine: the habitual sequel is a night of disturbed delirium followed by a day of tantalising drowsiness. The risk of opiates is greatest when heart disease is complicated with renal disease, or with profuse bronchorrhœa. Broadbent, while praising the comforting effects of a hypodermic injection of morphine in some cases of aortic incompetency, admits the risk attending it.

The dose of morphine may be reduced by com-

bining it with other hypnotics in such a draught as the following:—

℞ Morphinæ sulphatis	...	...	...	gr. ij.
Chloral hydratis	...	...	...	℥ij.
Syrupi ...	...	...	...	℥ij.
Aquæ ...	...	...	...	ad ℥iv.

Misce, fiat mistura. Take one dessertspoonful in a wineglass of water at bedtime.

Codeia, in quite small doses, answers well in some cases. *Chloral* has been branded as an unsafe drug on account of the cardiac depression it is reputed to induce, but we consider this exaggerated. *Chloral-amide* is said to be free from this objection; we prefer to give a moderate dose of 20–25 grains, combined with an equal amount of sodium bromide: this is less liable to excite headache than a full dose of chloralamide alone. Osler recommends half a drachm of *spirit of camphor* combined with spirit of chloroform given in a little hot whisky and water at bedtime.

Sodium bromide is one of the safest remedies for the insomnia of mitral cases. We have often found a combination of 20 grains of sodium bromide and a dram of tincture of hops in an ounce of chloroform water answer well as a hypnotic in these cases. *Veronal* we have found a very serviceable hypnotic. *Sulphonal* and *trional* are useful, but act slowly, and it is best to give them about an hour before the last meal of the day in order to obtain their hypnotic effect during the night. *Paraldehyde* may also be used, but has the disadvantage of a clinging nauseous taste. *Hoffmann's anodyne* also deserves a trial.

Hitherto we have been considering chiefly the treatment of mitral lesions and the circulatory disturbances they involve. It will be convenient now to examine the treatment adapted to the effects of **aortic** lesions which have not yet led to secondary insufficiency of the mitral, for in the latter case the preceding considerations would be as applicable as to cases which were primarily mitral. Although in

every case of valvular disease the prime consideration in treatment is the general muscular efficiency of the heart as a whole, we must not overlook the special indications afforded by individual valve lesions.

Aortic stenosis without insufficiency is one of the least serious of all valvular affections. The induration of the valves upon which it depends is usually associated with general arterio-sclerosis, and not with endocarditis, and it is, therefore, commonly a disease of advanced age. When the obstruction is but slight it is usually completely compensated by a small amount of ventricular hypertrophy, and the patient may be for many years free from any subjective symptoms and unconscious of the existence of any valvular lesion. When this is the case no active treatment is necessary, or only such as may be required by any coexisting general arterio-sclerosis, or gouty or other blood states.

If, on the other hand, the stenosis is considerable, and imperfectly compensated by the ventricular hypertrophy, symptoms dependent on scanty filling of the arteries arise, such as pallor of the face, a tendency to syncope, giddiness, loss of memory, disturbances of vision and hearing, and other signs of cerebral anæmia.

The **indication for treatment** in these cases is to maintain or improve the nutrition of the cardiac muscle and to prevent degenerative changes and secondary dilatation; therefore the most suitable treatment for this state is mainly regiminal. Regular gentle exercise may be permitted, but all physical and mental exertion or excitement should be guarded against. Complete physical repose may at times be beneficial. Being much in the open air when the weather is propitious is advantageous for its tonic, restorative, oxygenating influence. The diet should be nutritious, but it should be carefully adapted to the digestive capacities of the patient. When a diet largely composed of milk is well borne and agreeable to the patient, it should be recommended. Animal

food, fish, and game in moderation may, however, suit other cases better. Purées of vegetables are most useful for the avoidance of constipation, and a small quantity of sound wine, or spirits and water, may be prescribed with advantage, especially for the aged.

As a general rule, digitalis is not indicated in cases of aortic stenosis. In low degrees of obstruction, with evidence of imperfect compensation, it may be given a trial in small doses and with careful observation of its effects. But in higher degrees of obstruction it can only be harmful, and we must depend for the most part on those measures that reduce the work which the heart has to do, such as rest and the free exhibition of aperient drugs. Palpitation in these cases may be relieved by the use of nitro-glycerine or sodium nitrite, which lessens peripheral resistance. If there is reason to think that the valves have been injured by chronic inflammatory processes of syphilitic origin, full doses of potassium iodide may be indicated along with appropriate antisyphilitic remedies.

Aortic insufficiency is, perhaps, the most serious of all valvular lesions. The seriousness of the lesion is, however, dependent on the amount of regurgitation which the incompetent valves allow of during the ventricular diastole. It is almost invariably accompanied by considerable ventricular dilatation, and, when this form of valvular disease occurs in the young and vigorous, the extent of the enlargement may be taken as an index of the amount of the regurgitation. Aortic insufficiency necessarily causes the left ventricle to receive two currents of blood during its diastole, one proceeding from the left auricle—a direct current—the other from the imperfectly-closed aortic orifice—a backward current. If this back-flow be but small in amount, the contents of the left ventricle will be but slightly augmented, and its consequent dilatation and hypertrophy will be inconsiderable; but if the backward (regurgitant)

current be large in amount, the contents of the left ventricle will be greatly increased, and its consequent dilatation and hypertrophy will be very considerable. So we may generally conclude that an enormously enlarged heart associated with the signs of aortic insufficiency point to a large regurgitant current through the incompetent valves. Dilatation of the left ventricle may lead to the development of secondary mitral insufficiency, and thus we shall have the same series of morbid changes, on failure of compensation, which we have already traced. But we are now dealing with those cases of aortic insufficiency in which the mitral valve remains competent. Owing to the enormous dilatation and hypertrophy of the ventricle which occurs in many cases of aortic insufficiency a very greatly increased volume of blood is discharged, with greatly increased force, into the aorta and the arterial system at each ventricular systole. This produces a certain constantly recurring strain on the arterial walls, leading to chronic inflammation and induration of their coats, and, in the case of the aorta, often to great dilatation. The occurrence of anginal symptoms, or pain in the cardiac region, is a common incident in these cases—a subject to which we shall have to refer hereafter.

A great amount of regurgitation through the aortic valves must necessarily affect the cerebral circulation; the sudden emptying of the large vessels which convey blood to the brain, from the reflux through the incompetent aortic valves, leads to symptoms dependent on cerebral anæmia; sustained intellectual effort becomes difficult, and great irritability of temper is often noticed. Any sudden change of position, especially from the recumbent to the erect position, is apt to be attended with giddiness or even fainting, and sudden fatal syncope is not uncommon. Certain symptoms may be caused by the concomitant cardiac hypertrophy, such as headache, dizziness, disturbance of vision, or even paralysis from cerebral hæmorrhage. Symptoms due to embolism are also

especially prone to occur in advanced stages of aortic disease. Emboli may be carried into the cerebral vessels or into those of the spleen, liver, or kidneys. For some of the symptoms which may arise from failure of compensation in aortic valve disease we have no remedies; but for others, and especially for those dependent on cerebral anæmia, we may do much by judicious management. Rest in the recumbent position and the avoidance of all physical and mental excitement are of great value. Supporting food and a moderate amount of alcoholic stimulants are necessary. At the same time the bowels should be kept regularly relieved by gentle aperients.

We must bear in mind the risk of sudden death in these cases, and caution such patients against all hurry and over-exertion; and we should insist on periods of complete repose in the recumbent posture from time to time. Most striking is the improvement that follows a few weeks of complete rest in some of these cases.

Some differences of opinion exist as to the propriety of giving *digitalis* in cases of aortic regurgitation with failing compensation. It has been urged in opposition to its use that by prolonging the diastolic period such a fall in blood-pressure may be induced as to incur the danger of fatal syncope. But we believe the true test of the value of digitalis in these cases is the state of integrity of the cardiac muscle; if it is the seat of advanced degenerative changes (and this is not inconsistent with enormous increase in size), then digitalis will be of little use; but if the cardiac muscle is fairly sound, and in a condition to respond to the tonic effect of digitalis, we believe that the sustained systolic contractions promoted by the judicious and cautious use of this drug will far more than compensate for the prolonged diastole, provided always that the patient is kept in the recumbent position in bed, and the pulse carefully watched, so that the heart's action is not allowed to be too much slowed. Moreover, it must be borne in mind that a flabby

muscle will offer no resistance to over-distension from a considerable back-flow, but, on the other hand, a fairly sound ventricular muscle contracting vigorously under the tonic influence of digitalis, and better nourished by improved intracardiac sanguification thus induced, is much less likely to yield to the distending effect of the arterial reflux than a flabby muscle with no such sustaining help, and therefore the emptying of the arteries would be greater in the latter than in the former case. And, further, these considerations are consistent with clinical observation. In subjects of aortic regurgitation attacked with palpitation from failing heart power, we have seen the most striking improvement follow the regulating effect of a few doses of digitalis, together with recumbency. Ten minims of the tincture, with 30 minims of aromatic spirits of ammonia and 20 minims of spirits of ether or chloroform, may be given every five or six hours.

For Dr. Balfour's elaborate argument in favour of the use of digitalis in aortic disease we must refer to a paper he published on the subject,* but we may quote his conclusion. "When," he says, "from any cause compensation is ruptured, an aortic heart will be found as amenable to the beneficial influence of digitalis as any other failing heart, but larger doses are required; but little influence is produced by less than three times as much as would suffice for a mitral heart. Even should the pulse under treatment become abnormally slow, which is not at all usual, and certainly not needful to secure benefit, we may rest assured that excessive regurgitation is not then promoted; and though sudden death is not at all unlikely to happen, in a badly compensated aortic heart, whether it is treated with digitalis or not, digitalis is never to blame for this. On the contrary, the judicious use of digitalis is the most efficacious treatment in all cases of failing heart, whether that failure be accompanied by aortic or mitral regurgitation. In failure dependent on arterio-sclerosis

* *Brit. Med. Journ.*, June 4, 1892.

alone, the tonic influence of digitalis on the heart is hindered, unless we combine with it some drug which unlocks the arterioles, and so prevents an increase of blood-pressure, already abnormally high." We would only repeat that the dose of digitalis should be carefully watched. When we have brought the pulse down to 60 or 70 the dose should be diminished, and when giving larger doses we should keep the patient recumbent in bed, for there is much more danger in greatly prolonging the diastole when the patient is in the upright position, with excessive regurgitation, owing to the risk of completely emptying the cerebral vessels.

Broadbent considered digitalis valuable in aortic regurgitant disease when symptoms of mitral incompetence are added to the physical signs of aortic regurgitation, i.e. distended pulsating jugular veins, liver enlargement, and dropsy. But he thought it was rarely of service in the absence of mitral symptoms, and might do harm by setting up vomiting and thus cause serious asthenia.

It is certain that great discrimination and judgment are required for the right use of digitalis in cases of aortic regurgitation.

The **nitrites** are very useful in allaying **palpitation** and pain in these cases, but their influence is very temporary, and the doses have often to be rapidly increased to produce any beneficial effect. We are in the habit of using liquor trinitrini in combination with digitalis in many cases of aortic insufficiency, with a view to correcting the constricting action of the latter on the arterioles. For transient irritability of the heart alkaline bromides, valerianates, or Hoffmann's anodyne may be tried.

For the relief of the attacks of paroxysmal **pain**, often of a truly anginal character, which frequently occur in aortic cases, we shall require to have recourse to various remedies. *Potassium iodide* in full doses, 10 grains three times a day, is often very efficacious in the relief of this symptom. *Nitro-glycerine*, of the

effects of which we shall speak more fully when considering the treatment of angina pectoris, may also in many cases be given with benefit. We have given sodium nitrite in 2-grain doses combined with sodium iodide in 5-grain doses thrice a day, with great temporary relief in such cases. The distressing substernal ache of subacute aortitis may be relieved by a succession of flying blisters, by cupping, or by the actual cautery at the site of pain. If the pain resembles that of aortic aneurysm, the abstraction of 4 to 6 ounces of blood has sometimes been found effectual in relieving it.

But for the relief of this symptom, as well as the **dyspnœa** and nocturnal **sleeplessness** of aortic insufficiency, we shall often be obliged to have recourse to the preparations of *opium* or *morphine*. There is not the same objection to the use of opium in these aortic cases as in those of mitral disease with pulmonary engorgement and dropsy. Many authors maintain that opium increases the amount of blood circulating in the brain, and therefore relieves the cerebral anæmia. But we believe the beneficial action of opium in these cases to be chiefly due to its sedative, regulating effect on the excited cardiac muscle. It steadies the heart, and enables it to do its work more effectively, and it removes cardiac and cerebro-spinal hyperæsthesia. In this way, no doubt, it may indirectly improve the cerebral nutrition. A suppository of morphine is the most suitable mode of administration: the relatively slow rate of absorption is some safeguard against the dangers incident on hypodermic injection, and at the same time we avoid much of the derangement of digestion that is apt to follow the taking of opiates by the mouth. If given by the mouth it is well to use small doses at first, and to administer some alcoholic stimulant at the same time, to counteract any remote depressing effect. If we give it by the mouth—and we prefer that to the hypodermic method in cardiac diseases—it is desirable that the stomach should contain little

or no food, so that stomach digestion is not interfered with. We may give occasionally a draught containing 20 minims of liquor morphinæ hydrochloridi, or 10 minims of the liquor opii sedativus, with 20 minims of spiritus ætheris comp., in an ounce of peppermint water.

Our objection to the hypodermic use of morphine in chronic valvular disease is founded on the knowledge of serious conditions of cardiac failure which we have occasionally seen follow this method of giving it—owing, we believe, to its very rapid absorption when thus administered—but we have not seen these serious results follow when it is given in suppository or by the mouth combined with a stimulant.

It must be borne in mind that it is never safe to give even small doses of opium or morphine when there are evidences of renal changes, or of advanced degeneration of the cardiac muscle. At all times we prefer *codeia*, if it proves efficacious, and it should be tried before we have recourse to morphine. Some give 20-grain doses of chloralamide, and others have recommended tincture of henbane in hot brandy and water. Attacks of cardiac asthma from aortic incompetence are often relieved by alcohol; strychnine in combination with sal-volatile and Hoffmann's anodyne has also been found of value in the same cases. The ordinary ether and ammonia mixture is useful, so is the inhalation of chloroform, or of oxygen.

It must be admitted that the introduction of the *nitrites* into cardiac therapeutics has been a great aid in the treatment of this class of cases; if we are to get continuous relief from these, it will be necessary to increase the dosage progressively far beyond the officially sanctioned limits: we have given as much as 7 minims of liquor trinitrini at a dose, and a daily maximum of 30 minims. In most cases of paroxysmal cardiac dyspnœa their influence will prove beneficial, as well as in cases of paroxysmal attacks of pain of cardio-vascular origin. But the point to bear in mind is that they are only of temporary value; they may

act at times as useful auxiliaries to cardiac tonics, but if administered continuously for long periods they tend to act as cardiac depressants.

Exercise Treatment of a Case of Cardiac Failure confined to Bed

The treatment for the first few days should be very gentle, and given with the patient recumbent and his head supported on a pillow.

1. *Breathing exercise.*—The operator places his hands on the back of the patient's chest, one on either side, and lifts it gently from the bed during inspiration, letting it fall, gently also, during expiration. This is repeated some ten times according to the condition of the patient.

2. *Arm kneading and arm rolling.*—Each arm is kneaded in turn through the clothing. In this way exposure to cold is avoided. The kneading is done mainly between the two hands, and in an upward direction, but a certain amount of pétrissage is also given. (Two minutes' kneading for each limb is enough for the first few treatments.) This is followed by arm rolling. The arm is held at the elbow and wrist, and slowly circumducted in each direction about six times. The patient must be warned not to hold his breath while movements are being performed.

3. *Breathing exercise* (1) is repeated.

4. *Leg kneading and foot rolling.*—The kneading is performed in the same way as for the arm. If there is oedema of the feet, effleurage is given in addition from the feet to the knees. It is better to do this on the bare leg. One hand is then placed on the patient's ankle, while the other grasps the foot, which is circumducted inwards, downwards, outwards and upwards successively some forty times, when the direction is reversed and the same manœuvres are repeated.

5. *Breathing exercise* (1) is repeated.

In a first treatment the above is in most cases sufficient. In some cases the breathing exercises and

movements are diminished in number, according to the condition of the patient. The pulse, respirations, and general condition of the patient must be carefully watched throughout. A rapid pulse should be slower and stronger after the treatment than before.

Passive movements of other joints, such as the knee and elbow, are gradually added. Active movements should not be given until there is definite improvement from the passive. Later the movements are gently resisted by the operator. Finally, when the patient can sit up in bed, a scheme such as the following is given:—

1. *Breathing exercise in sitting posture.*—The patient sits up and leans back against the chest of the operator, who is seated on the bed behind him. The operator then puts one hand under each of the patient's axillæ, and lifts his chest during inspiration, letting it fall during expiration. He must take care, while giving breathing exercises, to breathe in time with the patient. This is repeated some ten times.

2. *Trunk circle-turning.*—The operator, seated behind the patient, supports his body as before. He then carries the patient's body forward, to the left, backwards, and to the right successively, thus describing circles. The pelvis is fixed on the bed so that the movement takes place at the waist. This is done slowly to enable the patient to breathe comfortably. It is repeated some eight times in each direction.

3. *Arm kneading, arm rolling, and gently resisted elbow flexion and extension.*—These are given with the patient lying down. The elbow flexion and extension is given some ten times. The operator grasps the patient's upper arm and forearm, and gently resists the movement, which should be carried to full flexion and extension.

4. *Breathing exercise in sitting posture* (1) is repeated.

5. *Trunk side-bending in sitting posture.*—The patient bends his body first to one side and then to

the other. The operator sits behind him and steadies him with a hand on each side. This is repeated some five times to each side.

6. *Leg kneading, foot rolling, and knee flexion and extension (gently resisted).*—These are given with the patient lying down. The knee exercise is given some six times to each knee. The operator grasps the thigh with one hand and the foot with the other, and exercises slight resistance, while the patient bends his knee up as far as he can. The operator then flexes it to its full extent, that is until the knee almost touches the body, if the patient has been unable to do so. Then the patient extends his knee until the leg is straight, while the operator again resists him.

7. *Breathing exercise in sitting posture* (1) is repeated.

(*This scheme of exercises is that practised by Mr. E. B. Clayton in the wards of King's College Hospital.*)

ADDITIONAL FORMULÆ

In aortic incompetence, with congestion and œdema of lungs and bronchial catarrh

℞ Ammonii carbonatis, ʒj.
Tincturæ hyoscyami, ʒiv.
Potassii iodidi, ʒj.
Tincturæ digitalis, ʒj.
Infusi calumbæ ad ℥vj.

M. f. mist. A tablespoonful every four hours. (*Balfour.*)

For pain in chronic valvular disease

℞ Tincturæ digitalis, ʒijss.
Potassii iodidi, ʒiij.
Extracti cocæ liquidi, ʒij.
Spiritus ætheris nitrosi, ʒj.
Aquæ et glycerini ad ʒiv.

M. f. mist. A teaspoonful in two tablespoonfuls of water four times a day after food. (*Whitla.*)

Diuretic mixture in heart disease

℞ Potassii iodidi, ʒjss.
Spiritus ammoniæ aromatici, ʒiv.
Succi scoparii, ʒjss.
Tincturæ digitalis, ʒij.
Infusi senegæ ad ℥vj.

M. f. mist. A tablespoonful in water every six hours. (*Whitla.*)

Cardiac stimulant and diuretic combined

℞ Potassii acetatis, gr. xx.
Tincturæ digitalis, ♏x.
Tincturæ scillæ, ♏xx.
Liquoris strychninæ hydrochloridi, ♏iv.
Infusi senegæ ad ʒi.

M. f. haust. To be taken every four hours. (*Bruce.*)

For mitral disease, with bronchial catarrh and dropsy

℞ Tincturæ scillæ, ʒij.
Tincturæ digitalis, ʒij.
Aquæ cassiæ ad ℥vj.
M. f. mist. A tablespoonful every four hours. (*Balfour.*)

Diuretic calomel powders

℞ Hydrargyri subchloridi, gr. iij.
Extracti opii pulveris, gr. $\frac{1}{6}$ ad $\frac{1}{4}$.
Sacchari albi, gr. v.
M. f. pulv. To be taken three times a day for three days; then suppressed for three or four days, and renewed, if well borne. (Use a chlorate of potash gargle at same time.) (*Bamberger.*)

For bronchial catarrh of cardiac origin

℞ Quininæ sulphatis, gr. viij.
Acidi benzoici, gr. iij.
Sacchari albi, gr. lxxv.
M. et divide in pulv. vj. A powder every two hours. (*Bamberger.*)

Cardiac tonic

℞ Tincturæ digitalis, ♏v.
Tincturæ ferri perchloridi, ♏x.
Acidi phosphorici diluti, ♏x.
Aquæ ad ʒj.
M. f. haust. To be taken three times a day immediately after meals. (*Bruce.*)

CHAPTER XVIII

TREATMENT OF CARDIAC HYPERTROPHY AND DILATATION; AND OF DEGENERATIONS OF THE MYOCARDIUM

PRIMARY CARDIAC HYPERTROPHY: Causes—Symptoms—*Treatment*—Regiminal and Dietetic—Usefulness of Mild Aperients—Digitalis to be avoided—Bromides—Valerianates—Aconite and Veratrum viride.

SIMPLE DILATATION and CARDIAC STRAIN: Causes—Excessive Physical Exertion—Malnutrition—Exhaustion of Acute Disease—Tobacco—Alcohol—Anæmia—Symptoms—*Treatment*—Rest—Open-air Life—Suppression of Tobacco and Alcohol—Cardiac Tonics—Importance of Rest and Careful Feeding in Advanced Cases—Venesection—Advantage of Aperients—Digitalis.

DEGENERATIONS: Fibroid Degeneration—*Fatty Overgrowth:* Causes—*Treatment*—Dietetic—Mineral Waters—Exercise—Oertel's Cure—The "Schott" Movements or Exercises—Artificial Nauheim Baths. *Fatty Degeneration:* Causes—Symptoms—*Treatment*—Digitalis—Rest—Food—Stimulants—Strychnine—Formulæ—Free Aeration—Iron—Aperients—Sedatives for Restlessness and Insomnia.

Additional Formulæ.

WE must next refer briefly to the treatment of certain chronic changes in the walls of the heart, occurring independently of any valvular lesion, such as **hypertrophy, dilatation,** and **degenerations.**

Hypertrophy of the heart, independent of some obstruction in the course of the circulation, is a comparatively rare affection. As we encounter it clinically it is usually a consequence either of valvular disease or of some obstruction in the peripheral vessels, such as general arterial sclerosis, and this may either be caused by changes originating primarily in the walls of the vessels, or may be secondary to some morbid state of the blood, as in syphilis, gout, and chronic Bright's disease.

But cardiac hypertrophy does occasionally occur as a primary disorder, and it is then usually caused

by agencies which excite the heart to over-action. Nervous excitement may do this, by giving rise to habitually increased cardiac action. The excessive use of tea, coffee, alcohol, and tobacco, habitual intemperance in eating and drinking generally, and sexual excesses, lead to cardiac hypertrophy from over-action. Excessive muscular exertion, as in rowing, climbing, and other athletic sports and exercises, or in certain laborious occupations, is another frequent cause.

It must be borne in mind that while muscular exertion, by increasing the blood-pressure, excites cardiac hypertrophy, this hypertrophy itself tends further to increase the arterial tension, and the blood-vessels exposed to this additional strain become the seat of chronic inflammatory changes, so that cardiac hypertrophy, besides being a consequence, is also a cause of arterio-sclerosis.

When cardiac hypertrophy is simply compensatory, as in certain valvular lesions, no subjective symptoms arise as a consequence of the hypertrophy, and no treatment need be directed to it; but when hypertrophy results from abnormal morbid excitement of the cardiac action, then certain characteristic symptoms may arise and call for treatment. Palpitation is one of these; flushing of the face, spots before the eyes, noises in the ears, headache, giddiness, these and other symptoms are dependent on disturbance of the cerebral circulation, and this may, in certain rare cases, lead to cerebral hæmorrhage and apoplexy.

The **treatment** of simple cardiac hypertrophy of this form is chiefly regiminal and dietetic. All causes of excitement must be removed. Athletic exercises and laborious occupations must be curtailed. A wholesome out-of-door life, with strictly moderate and tranquil exercise, should be enjoined.

The severest moderation in diet must be enforced. Animal food should be taken only in small quantities, and fresh vegetables, well cooked, should enter largely into the daily dietary. Alcoholic stimulants should be prohibited, as well as the use of tea, coffee,

and tobacco. The amount of fluid consumed should not be great, and should be confined to the wants of the system, as it is undesirable to over-distend the blood-vessels with fluid. We must watch that the diet prescribed be readily and easily digested, and if it cause flatulent distension it must be suitably modified. If there is any tendency to abdominal plethora, free daily evacuation of the bowels will be a necessary measure in order to remove pressure from the abdominal vessels. A mild aloetic pill at night and a teaspoonful of Carlsbad or Homburg salts the following morning, in half a tumblerful of cold water, will usually accomplish this result.

On no account should digitalis be given to check the palpitation of simple cardiac hypertrophy. Bromides and valerianates may be prescribed for their sedative influence, but drugs such as aconite and veratrum viride can do nothing but harm.

We must next consider the treatment of **dilatation** of the heart, unconnected with valvular lesions. The extreme forms of cardiac dilatation are attended by much the same symptoms as accompany chronic valvular disease when compensation has completely broken down, and they, naturally, require the same treatment. In this section we are considering chiefly the treatment of moderate degrees of dilatation, instances of which have of late years been very frequent. The most common cause of simple dilatation of the heart is diminished resistance in its walls from impairment of muscular power. This state is a common sequel of exhausting diseases, as the infective fevers, influenza, or of any condition which has lowered the general nutrition, as anæmia, hæmorrhages, privation, etc. It is apt to follow pericardial adhesions, and the changes in the cardiac muscle which accompany acute endocarditis and pericarditis.

It may also arise from increased pressure within the cavities of the heart from habitual high arterial tension, but in that case the dilatation is rarely simple; it is then usually accompanied by hypertrophy,

unless the increased pressure should be associated with diminished resistance, and then the dilatation will be simple and rapid, as happens when severe muscular exertion is attempted by persons in weak or failing health, or in overworked men of middle age, who try to "walk themselves into condition" during an autumn holiday, when their condition is one really requiring prolonged physical rest.

The same may be observed in feeble youths who attempt to emulate the physical exploits of their stronger comrades; or in young anæmic girls under the prolonged strain of a life of social gaiety. In the working classes excessive labour, with insufficient food, may lead to similar results.

In all such cases increased pressure within the heart is associated with diminished resistance in its muscular walls. Attacks of influenza are especially prone to be followed by cardiac dilatation. Dilatation and symptoms of **"cardiac strain"** are also observed, not infrequently, both in youth and middle age, from the abuse of tobacco. Young men, in apparently good health, and in active exercise, will occasionally, and somewhat unaccountably, suffer from attacks of palpitation and faintness, and on examination the physical signs of cardiac dilatation will be found. Such a condition is sometimes found associated with sexual excess or masturbation, or it may be set up simply by an amount of physical exertion in excess of their powers; but in cases where none of these causes exists we shall often be able to trace the cardiac dilatation either to the excessive use of tobacco or to its persistent use by young men who are constitutionally sensitive to its depressing effects. In middle-aged men, after smoking for twenty or thirty years without obvious ill-effect, it will not seldom happen that symptoms of cardiac dilatation appear somewhat suddenly, and it may be difficult to convince them at first that it is due to the tobacco which they have used so long with impunity. Alcoholism is often associated with dilatation of the heart.

Anæmia, nervous excitement, anxiety, faulty habits of life, especially with respect to food and exercise, are common causes of cardiac asthenia and dilatation in women, and less frequently also in men. Indeed, whatever leads to defective nutrition of the cardiac muscle must predispose to dilatation.

Dilatation, accompanied with more or less hypertrophy, is often observed as a result of the overexertion attending certain occupations, as in soldiers after forced marches or from excessive or unsuitable drill, and in miners and others engaged in very laborious occupations.

Broadbent enumerated among the occasional causes of cases of cardiac dilatation coming under his own observation "injudicious hydropathic treatment," the inhalations of Himrod's powder for the relief of asthma, and certain methods (Banting's) of reducing obesity. We have ourselves several times encountered it in women who have taken large amounts of thyroid preparations for the same purpose.

It must be remembered that in all cases of dilatation unattended by hypertrophy the ventricles fail to expel the whole of their contents, and in advanced cases only a small proportion of the blood contained in the ventricles is driven into the great vessels at each ventricular systole.

The chief **symptoms** of cardiac dilatation and asthenia are recurrent attacks of palpitation and irregular action of the heart, on any exertion; they often also occur at night, causing the patient to awake from sleep in much alarm. Dyspnœa on walking uphill or ascending stairs, or on making any muscular effort, is also common. In females complaint of cardiac pain is frequent, and on deep pressure over the cardiac apex with the point of the finger some hypersensitiveness of the cardiac muscle can often be made out. Liability to fatigue on slight exertion, with languor and feebleness, both physical and mental, accompanies most cases. The pulse is usually quick, compressible, and often irregular. The irregular and

insufficient supply of blood to the brain gives rise to lack of mental energy, failure of memory and attention, irritability of temper, and a tendency to attacks of giddiness and faintness. If these premonitory warnings are persistently ignored, anasarca and congestion of the thoracic and abdominal viscera may follow, as in the failure of compensation associated with valvular disease.

The **treatment** of these slighter forms of cardiac dilatation must, in the first place, consist in the withdrawal of the patient from the influence of all those conditions which have caused it. In those cases in which over-exertion has led to cardiac strain we must insist on the avoidance of all kinds of muscular effort, gentle exercise alone being permitted, and this restriction must be enforced for an adequate length of time. When this condition has been induced by over-excitement, emotional or mental, or by addiction to evil habits, these causes must be sought out and corrected. An open-air life in the country or at the seaside, a proper amount of regular exercise, always stopping short of fatigue, a nourishing but light and digestible diet, regular attention to the bowels, and early retirement to rest, are remedial measures too obvious to need insisting upon. When the disease can be traced to the use of tobacco or alcohol, or is aggravated by them, these must be wholly forbidden, and the rapid improvement in health which usually follows the relinquishment of these habits will go far to reconcile the patient to the sacrifice. Suprarenal preparations are often of value in cardiac dilatation due to thyroid toxæmia.

Some **cardiac tonic** will generally be advisable, and will, indeed, be indispensable in those forms of cardiac dilatation and feebleness which occasionally follow attacks of acute febrile and septic maladies, and also in anæmic cases. It will rarely, however, in mild cases, be necessary to have recourse to digitalis except where there is much dyspnœa and troublesome

palpitation. In such cases small doses of digitalis may be given in combination with iron, such as—

℞ Ferri et ammonii citratis ... ... gr. lxxx.
Tincturæ digitalis ... ... ♏xl.
Spiritus ammoniæ aromatici ... ... ʒij.
Infusi calumbæ ... ... ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls twice a day, an hour after meals.

We, however, prefer, in the less serious forms, to employ strophanthus, or strychnine, or nux vomica, with coca, in combination with iron, quinine, or arsenic, as may seem desirable. We have found one or other of the following formulæ very serviceable:—

℞ Quininæ sulphatis ... ... gr. xvj.
Tincturæ nucis vomicæ... ... ... ʒij.
(*Vel* tincturæ strophanthi ... ... ♏xl.)
Extracti cocæ fluidi ... ... ʒiv.
Spiritus chloroformi ... ... ♏lxxx.
Aquæ ... ... ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls twice a day, an hour before food.

Or,

℞ Ferri et quininæ citratis ... ... gr. lxxx.
Liquoris strychninæ ... ... ♏xxxij.
Spiritus chloroformi ... ... ♏lxxx.
Aquæ ... ... ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls twice a day, two hours after food.

Or,

℞ Ferri arsenatis ... ... gr. iv.
Quininæ valerianatis ... ... } āā gr. xxiv.
Extracti nucis vomicæ ... ... }

Misce et divide in pilulas xxiv. One three times a day after food.

In purely anæmic cases iron and nux vomica, together with some aperient to ensure a regular action of the bowels, will be most serviceable, as—

℞ Ferri sulphatis exsiccati ... ... gr. xxxvj.
Saponis ... ... gr. xviij.
Pulveris nucis vomicæ ... ... gr. xxiv.
Aloin ... ... gr. iv.

Misce et divide in pilulas xxiv. One or two (as necessary) twice daily, after lunch and idnner.

In cases of somewhat acute dilatation, however induced, the hypodermic injection of strychnine in doses of $\frac{1}{60}$ to $\frac{1}{20}$ of a grain will sometimes be attended with remarkably good results.

So far we have been considering only the milder forms and moderate degrees of cardiac dilatation, but in extreme cases the same series of morbid phenomena indicative of cardiac failure will be encountered as we have already described in non-compensated valvular disease, and the same treatment will be needed. Our chief resource in such a case must be the **most absolute repose.** Now and again a case of acute dilatation of the heart presents itself for treatment in which the symptoms are so extreme and so urgent that immediate relief is imperative. Such a condition occasionally follows a gross alcoholic debauch. In such a case we must not hesitate to relieve the embarrassed heart by the abstraction of 10–16 ounces of blood: venesection not only staves off the immediate danger of paralytic over-distension of the heart, but also paves the way for the effective use of other remedies. Hypodermic administration of strychnine, pituitary extract, or adrenalin, inhalation of oxygen, and the free exhibition of alcoholic stimulants will help to tide over the interval, until our cardiac tonics and eliminant methods come into play. Light, easily digested, or predigested, highly nutritious food must be prescribed—such as pounded meat very lightly cooked, beaten-up eggs, chicken and game panada, a little white fish when agreeable, milk, and a small quantity of good sound wine, or a little weak brandy or whisky and water; but the total amount of fluid taken must be strictly limited so as not to augment the volume of blood. A regular action of the bowels must be maintained by suitable aperients.

Free action of the bowels is very advantageous in nearly all cases of cardiac dilatation and feebleness, as we have previously explained. Aperients should, however, be so given as to clear away only the residue of digestion. For this purpose the best

method is to give an aloetic pill after dinner or at bedtime, and a saline dose early in the morning about an hour before breakfast. Careful attention must, of course, be given to the individual sensitiveness to aperient medicines. The following will be found applicable to most cases :—

℞ Extracti aloes ... ... gr. xij ad xxiv.
Ipecacuanhæ pulveris ... ... gr. vj.
Saponis ... ... gr. vj.
Extracti hyoscyami ... ... gr. iij.

Misce et divide in pilulas xij. One after late dinner or at bedtime.

℞ Sodii sulphatis ... ... 3j ad 3ij.
Sodii bicarbonatis ... ... gr. xx.
Sodii chloridi ... ... gr. x.

Misce, fiat pulvis. To be given early in the morning, after the pill, dissolved in half a tumblerful of hot water.

In those extreme cases in which from backward pressure the liver is enlarged, much relief is often felt from the application of 6 or 8 leeches over the hepatic region. A hot poultice should be applied after the leeches have been removed, to encourage the bleeding.

Broadbent strongly advocated the use of mercurial purgatives in these cases because of their action in diminishing arterio-capillary resistance and lowering arterial tension, and therefore relieving the heart. He gave at the outset one or more full doses of calomel or blue pill combined with rhubarb pill or colocynth and henbane, followed by a mild saline, and then a milder dose every second or third night.

Digitalis and other **cardiac tonics** should also be given at the same time, and other measures applied, full details of which will be found in the preceding chapter, in which we described their employment for the relief of the various symptoms of cardiac failure.

The scope and value of the Oertel and Nauheim methods of treatment will be considered subsequently.

Degenerations of the cardiac muscle do not offer much scope for therapeutic management: some forms, described as "fibroid disease" of the heart, and dependent on chronic myocarditis or obliterative endarteritis of branches of the coronary artery, and often associated with fibroid kidney, are very difficult of diagnosis and offer no other indications for treatment than such symptoms of cardiac failure and circulatory disturbances as may accompany them, and as are also common to dilatation and to non-compensated valvular lesions; and these we have already described, and their appropriate treatment has been pointed out.

There are, however, two conditions of the myocardium which may now claim a brief consideration from a therapeutic point of view, viz. "**fatty overgrowth,**" which so commonly accompanies excessive obesity, and "**fatty degeneration,**" properly so-called.

Fatty overgrowth is associated with a general tendency to the deposition of fat, and is often encountered in the obese. It may simply amount to an excess of the normal quantity of fat underlying the pericardium. In other cases the fatty deposit penetrates into the muscular substance of the heart, and is found as an infiltration between the muscular fasciculi.

In extreme cases of this kind the heart becomes enveloped in a thick covering of fat, and on section fat is found freely deposited amongst the muscular fibres, and this fatty infiltration may extend to the musculi papillares. Some of the muscular fibres are seen to be atrophied, others in a state of fatty degeneration. It follows naturally that the walls of the heart become flabby, and its cavities dilated, and symptoms of cardiac failure appear, and are more or less serious according to the extent of the fatty overgrowth or degeneration, and the dilatation thus induced.

The common symptoms of this condition are—

dyspnœa, at first only on exertion, but later becoming constant; giddiness and dizziness on change of posture; usually acceleration of the pulse, sometimes slowness, and then usually arterio-sclerosis; disturbance of digestion, flatulence, and constipation. In the later stages, when the presence of the interstitial fat has led to degeneration of the muscle fibres as well, the symptoms are those of profound heart failure, which we shall consider later in dealing with fatty degeneration.

The chief **causes** of this condition are indolent and luxurious habits of life, over-feeding, especially with carbohydrate foods, over-indulgence in alcoholic beverages, especially in beer, together with insufficient muscular exercise.

The **treatment** appropriate to these cases will depend upon the stage the disease has reached when the patient comes under observation. In the later stages the symptoms of cardiac dilatation and failure which present themselves will require precisely the same kind of management as is appropriate to fatty degeneration. In the earlier stages, where it may be presumed there is simply an excess of fatty deposit on the surface of the heart, and no serious amount of infiltration of the heart substance or atrophy of the muscular fibres, much may be done, with the frank co-operation of the patient, to ameliorate his condition and check the tendency to fatty deposition. In the first place all excesses in eating and drinking must be at once suppressed. No alcoholic beverages must be permitted, or at most a little sound claret or hock diluted with water. Drinking at meals must be forbidden, and such fluid as is needed must be drunk either half an hour before a meal or an hour or two after. This will at once diminish the amount of food taken at each meal and ensure its more complete mastication. A glass of hot water half an hour before a meal and at bedtime, to which a slice of lemon may be added for flavour, will be found useful

in promoting digestion, in flushing away waste products, in allaying thirst, and in promoting the secretion of bile and the regular action of the bowels. As in the treatment of obesity, fats and carbohydrates should be largely reduced in the daily dietary, and nitrogenous food taken in its stead. We must not aim at too rapid a reduction of corpulence, for excessive restriction may impair the nutrition of the heart muscle itself. The lean of butcher's meat, chicken, game, and white fish, preferably reduced to mince or pulp and lightly cooked, may be freely taken. Green vegetables and salads and ripe fruits in moderation may be permitted. Free action of the bowels must be promoted by the choice of suitable aperients. In the early stages of this affection much benefit often results from one or more courses of mineral waters and baths at Marienbad, Carlsbad, Kissingen, Brides, or Harrogate; or a combination of graduated physical exercises, together with gaseous saline baths, as practised at Nauheim.

Moderate regular exercise, walking or riding, should also be insisted on.

We may here take occasion to refer to what is known as Oertel's cure for cardiac diseases, and especially for this form of disease. It may be described as consisting of graduated and systematised **hill-climbing,** a method of treatment of some value in a limited class of cases, but not unattended with danger when widely or indiscriminately applied —a fact that has had some serious and notable exemplifications in the land where it originated.

In many health resorts in Germany and Switzerland this so-called "Terrain-Kur" was added to their other attractions, and systematised hill-climbs were marked out and adapted to different degrees of cardiac disability. But it has fallen into comparative disuse. It was not suited to uncompensated cases of valvular disease, and compensated cases found the system monotonous and tedious.

Gentle climbing exercise in compensated cases of valvular disease, in light, bracing air, amidst agreeable scenery, may serve to maintain and improve compensatory hypertrophy and also to promote general nutrition, especially in those who are prone to habits of indolence and inactivity. But it is especially in cases of fatty heart, fatty infiltration without degeneration of the muscle, that this system may be of service, as it insists on regular, graduated exercises, a most important auxiliary to other means of cure, such as baths and frictions, massage of the muscles, a suitably regulated diet with strict limitation of liquid, and perhaps a course of mineral waters at one of the spas we have named. The object is to get rid of the excess of fat and to restore the cardiac tone. It is occasionally adopted as a supplementary course to what are known as the Schott methods, to which we must in the next place refer.

The **Schott** or **Nauheim** system of treatment of heart disease consists in the application of "*resistance exercises*," and the use of the saline and gaseous baths at Nauheim.

An essential condition of success in this treatment is the presence of a *reasonable degree of integrity of the heart muscle.* The exercises are thus often of great value in early conditions of valvular disease, of fatty overgrowth, or of cardiac dilatation, when compensation has been temporarily restored by other measures. We consider that they are fraught with danger in all cases of advanced degeneration of the heart muscle, and in the later stages of valvular disease, when compensation has failed beyond repair. We should also hesitate to recommend their use in any case of free regurgitation or of tight constriction of a valvular orifice, even though the heart muscle appeared to be sound and responsive.

The resistance exercises are systematic and regulated movements of the different groups of muscles, carried out slowly and without jerkiness, and

gently resisted by the physician or his assistant. These movements are never repeated twice in succession, and each movement is followed by a brief repose. The patient is, of course, carefully watched during the exercises, and at any sign of circulatory or respiratory trouble, or of muscular or nervous exhaustion, the movements are at once suspended. He is told to breathe freely and uninterruptedly throughout. The eighteen movements of which the exercises consist will be described at the end of the chapter (p. 434). In beginning this treatment it may be proper to apply only a portion of the exercises, which may be cautiously increased. This is necessarily so if the patient is confined to bed, or compelled to sit during the treatment. The whole series should occupy about half an hour. In commencing a course once a day is sufficient, but as the power of the heart increases they may be repeated. The most suitable time will be an hour or so after a meal. The movements are free from risk, if regulated to the cardiac and not to the muscular strength of the individual. It has been noted that the effect of these exercises is to cause a slowing of the pulse-rate, and an increase in the pulse-volume. It is also maintained that they lessen the area of cardiac dullness, and, when dilatation is present, cause the apex beat to return towards its normal position. In addition to these exercises the Schott method comprises the application of the saline baths of Nauheim in the following manner. The chief constituents of the Nauheim springs are sodium chloride (20 to 30 parts in 1,000) and calcium chloride (2 to 3 parts in 1,000), together with a large amount of free carbonic acid, and they are of a temperature varying between 82° and 95° F. These waters are used either as (*a*) *brine baths*, or (*b*) *effervescing baths*, or (*c*) *effervescing current baths*.

The first are freed from carbonic acid gas, and are used in graduated strengths produced by the addition of brine from the neighbouring salt-works.

The second contain the natural carbonic acid gas in varying quantities, and are varied in temperature to suit particular cases.

In the third or stream baths the water is allowed to stream through the baths while in use.

The effervescing baths are said to lessen the pulse-rate, increase its volume, and raise the tension. They also, at first, quicken and deepen the respirations. The treatment usually begins with the weak brine baths at a temperature of about 95° F. and a duration of five minutes. After a time the temperature of the bath is lowered a degree or two at a time, and its strength and duration are increased (to ten minutes).

The brine bath is changed to an effervescent bath as soon as the patient is thought able to bear it—at a temperature of 92° to 95° F. and a duration of about six minutes. The temperature is gradually lowered and the duration increased.

The effervescent *stream* bath is rarely employed, and only in such cases as can bear so strong a stimulant. Artificial, imitation Nauheim baths can be easily made, and they have the same effects as the natural springs.

The formula for these baths is given at the end of this chapter (p. 435). The graduation of strength of ingredients, of temperature, and of duration must proceed side by side. The patient must repose for a time after each bath, and he should not take more than three or four baths a week, and not more than two on successive days. A course of three or four weeks is usually needed.

Unfortunately this method of treatment has been commercially boomed to an extent which has rendered it difficult for the profession at large to form a just and accurate opinion as to its true value and applicability.

One of us has elsewhere * stated his own experience of the Nauheim baths as follows: "Without

* Crawfurd, *Practitioner*, Nov., 1905.

claiming for them the extravagant effects asserted by some, no one who has used them, or seen them used, can reasonably doubt their efficacy in some instances. Speaking from my own sensations, and personal observation of patients, I can vouch for some initial slowing of the heart. It is difficult to see to what to assign this, unless to stimulation of the cardio-inhibitory centre reflexly from the cutaneous nerve endings by the action of carbonic acid gas, for the same effect was not produced by the Wiesbaden waters, which differ mainly in the absence of free carbonic acid gas. Later there sets in an abiding dilatation of the cutaneous capillaries, with disappearance of the initial slowing of the heart. The former feature, though in a less degree, was appreciable with the Wiesbaden baths, so that presumably it may be referred to the action of both sodium chloride and carbonic acid gas. At the same time, one must not lose sight of the stimulation of the nervous system and the deepening of respiration that result from a bath. It is easy to see how these combined effects would lead to a strengthening of systole, and to a diminution in size of the heart over and above the apparent diminution due to fuller expansion of the lungs."

As to the conclusions that have been advanced by some with respect to the reduction of the area of percussion dullness observed after these baths and exercises, they are certainly for the most part fallacious, as are also the figures with which they have been illustrated.

The result of a series of careful observations made by us in King's College Hospital as to the effect of these baths on the area of cardiac dullness appeared to show clearly that the diminution of this area was caused mainly by a modification of the type of respiration—the measurements of the chest circumference showed that there was an increased expansion of the upper part of the lungs, the portion least used in ordinary quiet breathing; that, in short, the type

of respiration becomes changed, and a superior costal type takes the place to some extent of the more habitual inferior costal and abdominal type. "This accounts for the rise in the level of the diaphragm and the position of the apex beat noted by Schott and others. It accounts to a great extent for the rapid contraction in the right boundary of the area of cardiac dullness, as the marked increase in the capacity of the upper regions of the lung would greatly widen the respiratory area, and would thus exercise a decided influence on the condition of the right side of the heart in the way of promoting and facilitating the emptying of its cavities."*

Fatty degeneration is a true granular and fatty degeneration of the cardiac muscle, which becomes pale and flabby. It arises in connection with defective nutrition, and may therefore be merely a senile change; it occurs also in cachectic and wasting diseases, and after prolonged attacks of the infective fevers. It may be the result of acute and chronic anæmia, especially of that form which is termed pernicious; it is a well-known consequence of phosphorus poisoning; it sometimes follows attacks of pericarditis; it may be dependent on disease of the coronary arteries; and it is a common feature in the degenerative changes of chronic hypertrophy. It is also a natural termination of advanced conditions of fatty overgrowth, in which the pressure of the interstitial deposit of fat leads to degeneration of the muscle fibres themselves.

The symptoms of fatty degeneration are those common to cardiac failure from any cause; the diagnosis of this condition is therefore difficult, especially if a systolic apex murmur should happen to be present. The existence of very marked signs of cardiac failure without any history of pre-existing valvular disease, or exposure to the ordinary causes of endocarditis, may excite a well-grounded suspicion of the existence of fatty degeneration.

* *See* the author's paper in *International Clinics*, July, 1896.

The breakdown is also often comparatively sudden; dyspnœa is complained of on the slightest exertion, with sighing and a sense of oppression in the chest. There are great muscular debility and incapacity for any exertion, physical or mental. Irritability of temper and other mental disturbances are probably dependent on an insufficient blood supply to the brain. The patient often feels cold and depressed, and his pulse is found to be slow, feeble, irregular, and intermittent: it may sink as low as 30 in the minute. The cardiac impulse is feeble, perhaps imperceptible, the first sound weak, and the action arrhythmic; a systolic apex murmur may or may not be present. The area of cardiac dullness is often notably increased. Sleep is often disturbed by distressing attacks of cardiac asthma, so that the patient fears to fall asleep. Anginal attacks occur in some cases. Œdema of the lower extremities is of grave import.

These are the symptoms which our **treatment** must be directed to relieving. In all such cases we should begin by giving digitalis; the less advanced the degeneration the more likely it is to be useful, and it can do no harm; but if we find no response to its use in the shape of improved cardiac action, it is of no avail persisting with it. We should not, however, give digitalis when the pulse is very slow and irregular, with a tendency to syncope.

In the more advanced and serious cases absolute rest in the semi-recumbent position is for a time of prime importance, and, at regular intervals, a proper amount of light, easily digested, nourishing food must be given. If the patient responds readily to small amounts of alcoholic stimulant, such as a few teaspoonfuls of brandy or whisky in a little hot milk, there is no good reason for withholding it, although we must be especially careful not to yield to any morbid craving in this direction. To remove the sense of faintness or threatened syncope, and the distressing feeling of oppression at the chest, some

diffusible stimulant will certainly be frequently necessary, such as the following :—

℞ Spiritus ætheris compositi ... ... } āā ℥iv.
Spiritus ammoniæ aromatici ... }
Tincturæ nucis vomicæ ... ... ℥iss.
Tincturæ lavandulæ compositæ ... ... ℥iv.
Aquæ carui ... ... ad ℥viij.

Misce, fiat mistura. One or two tablespoonfuls, with a tablespoonful of water, when necessary.

Strychnine is a very useful medicine in these cases, and it may sometimes be combined with coca with good effect, as in the following :—

℞ Liquoris strychninæ ... ... ♏xxxij.
Extracti cocæ liquidi ... ... ℥iv.
Spiritus chloroformi ... ... ℥ij.
Aquæ cinnamomi ... ... ad ℥viij.

Misce, fiat mistura. Two tablespoonfuls three times a day.

Oxygen inhalations are valuable as a cardiac restorative, stimulating cardiac nutrition and promoting metabolism.

If, perchance, there should be anginal attacks amyl nitrite should be inhaled, or a nitro-glycerine tablet containing the equivalent of 1 minim of a 1 per cent. solution may be given. If relief is afforded, this may be repeated at regular intervals.

Being much in the open air—the fresh air of the country—in order to promote as complete oxygenation of blood as possible, is extremely desirable ; a hammock, or some suitable couch for reclining, out of doors, or regular daily drives in an open carriage, are needed in these cases, and, when the patient is strong enough to travel, much good will often result from passing the winter in a warm, sunny climate.

Such patients are very sensitive to cold, and require very warm clothing. In the less serious forms a certain amount of gentle walking may be permitted in fine weather, although there is a tendency, nowadays, rather to overdo physical

exercise in cases of cardiac weakness; and as cases of fatty degeneration are notoriously difficult of diagnosis, the benefit that has been observed to follow physical exercise, in some instances, may have been due to the fact that they were not cases of true fatty degeneration, but of temporary cardiac asthenia with dilatation. In all these cases the effect of exercise should be carefully watched, and its influence on the cardiac action noted. It must be remembered that anginal attacks are not uncommonly provoked in these cases by unwise attempts at physical exertion. The Nauheim bath-treatment is notoriously unsuitable for these patients.

Preparations of iron are useful in the less advanced cases. We may combine the citrate of iron and ammonia in 10-grain doses with ½ dram of aromatic spirits of ammonia and an ounce of infusion of calumba, and give it three times daily; or we may give 10 grains of the citrate of iron and quinine and 3 to 5 minims of liquor strychninæ in ½ ounce of chloroform water in the same way; or we may give a pill of a grain of valerianate of iron and a grain of extract of nux vomica after meals three times a day.

What we have before said about the use of aperients in cases of cardiac failure must still be borne in mind, and the regulation of the bowels and the digestive functions generally must be duly seen to. Unless there is any dropsy it is best, however, not to produce watery motions, and a dinner pill of aloes, rhubarb, and ipecacuanha will be most suitable.

As the digestive functions are generally very languid, it is often useful to give 5 or 6 grains of pepsine or a teaspoonful of acid glycerine of pepsine after each meal of animal food. No attempt should be made to employ the restricted dietary indicated in conditions of simple fatty overgrowth. The muscle of the heart is now ill nourished and unable to respond to the demands of the tissues. Diet

should be light and nutritious, and in the matter of proteid foods generous: carbohydrates and fats should be allowed, so long as they do not interfere with the taking of a sufficiency of proteins.

Restlessness and insomnia are often distressing symptoms in these cases, and although it is, for many reasons, undesirable to give opium, we shall occasionally be obliged to have recourse to it. We should first, however, try the effect of sodium bromide in 15- to 20-grain doses, alone, or combined with 1 or 2 drams of tincture of hops, or 20 to 30 minims of compound spirits of ether. We may have recourse to any of the hypnotic remedies already mentioned as appropriate to the sleeplessness of heart failure as a sequel of valvular disease. If these fail we may try ½-grain and grain doses of codeia; and if we are obliged to give opium or morphine we prefer to do so in the form of a suppository of morphine. If, however, we decide in favour of administration by the mouth, we should begin by giving ⅛ grain sulphate of morphine with ½ dram of aromatic spirit of ammonia in an ounce of chloroform water, and if this dose agrees well and causes no faintness, but seems, as will sometimes be the case, to improve the cardiac action, it may be repeated after four or five hours. We disapprove of the hypodermic use of morphine in these cases, as the drug will, if administered in this way, sometimes exercise a seriously depressing effect on the heart, and fatal results have been known to follow.

ADDITIONAL FORMULÆ

In hypertrophy with aortic regurgitation

℞ Potassii bromidi, ʒij.
Spiritus ætheris nitrosi, ʒv.
Aquæ camphoræ ad ʒiij.

M. f. mist. A teaspoonful every two hours.

Powders for cardiac hypertrophy

℞ Asparagin, gr. x.
Potassii bromidi, ʒij.
Sacchari albi, ʒiij.

M. et divide in pulv. x. One thrice daily. (*Matlack.*)

Pills for cardiac dilatation

℞ Pulveris digitalis, gr. v.
Extracti belladonnæ, gr. j.
Ferri redacti, gr. xl.
M. et divide in pulv. xx. One thrice daily. (*Da Costa.*)

Mixture for simple dilatation

℞ Extracti ergotæ liquidi, ʒiijss.
Tincturæ digitalis, ʒss.
M. f. mist. A teaspoonful three times a day in water.
(*Bartholow.*)

In cardiac asthenia and dilatation

℞ Pulveris digitalis, gr. iij.
Quininæ sulphatis, gr. xv.
Pulveris rhei, gr. xv.
Sodii bicarbonatis, gr. xv.
M. et divide in pulv. x. One twice a day. (*Schnitzler.*)

Hypodermic injection of camphor in cardiac disease when digitalis fails. (It sometimes renews the effect of digitalis.)

℞ Camphoræ, ʒj.
Olei olivæ, ʒix.
M. Fifteen drops for a dose.
(*Alexander.*)

Pills for cardiac dilatation

℞ Ferri lactatis, ʒss.
Pulveris digitalis, gr. v.
M. et f. pil. xx. One three times a day. (*Da Costa.*)

Hypodermic injection of caffeine and morphine

(The caffeine is added for the purpose of avoiding the depressing effect of the morphine.)

℞ Caffeinæ, gr. ss.
Morphinæ sulphatis, gr. $\frac{1}{6}$.
Atropinæ sulphatis, gr. $\frac{1}{100}$.
Aquæ camphoræ, ♏xx.
M. f. injectio. (*Cochrane.*)

In fatty degeneration

℞ Spiritus ætheris, ʒj.
Tincturæ belladonnæ, ʒij.
Spiritus ammoniæ aromatici, ʒj.
Tincturæ zingiberis, ʒvj.
M. f. mist. A teaspoonful in a wineglassful of water when dyspnœa is severe. (*Whitla.*)

For cardiac asthma

℞ Tincturæ digitalis, ʒjss.
Tincturæ lobeliæ, ʒjss.
Aquæ laurocerasi, ʒiij.
M. Five drops every hour.
(*Bamberger.*)

For cardiac dyspnœa

℞ Potassii iodidi, gr. xx ad gr. xxx.
Chloral hydrate, ʒss. ad ʒj.
Mucilaginis acaciæ, ʒiv.
Syrupi floris aurantii, ʒiv.
Aquæ ad ʒiv.
M. f. mist. A tablespoonful every two hours. (*G. Sée.*)

THE SCHOTT MOVEMENTS OR EXERCISES

Each exercise is made against slight resistance applied by the physician or a trained assistant.

1. The arms are extended in front of the body at the level of the shoulder, with the palms of the hands touching. The two arms are then moved slowly outwards till they are in a line with each other; they are then brought back to their original positiou.

2. The arm aud haud hanging down with the palm turned forwards, the forearm is flexed upon the arm (which is kept still) until the fingers touch the shoulder. The forearm is then extended to its original posi-

tion. This is first done with one arm and then with the other.

3. The arms, hanging down as in No. 2, are raised outwards until the thumbs meet over the head; they are then returned to their original position.

4. With arms dependent, the fingers, at the first phalangeal joints, are pressed together, and the arms are then raised until the hands are above the head, after which they are brought back to their original position.

5. The arms, hanging in the position of "attention," are advanced forwards parallel to each other until they are elevated to a vertical position; they are then brought back to where they were before.

6. Same as No. 1, but with fists clenched.

7. Same as No. 2, but with fists firmly clenched.

8. The arms, starting from the position of "attention," describe a circle by moving forwards and upwards until they are raised vertically; then each palm is turned outwards and the arms descend backwards to their former position.

9. The body is bent forwards and then brought back to the erect position, the knees not being moved.

10. The body is rotated, without any movement of the feet, first to the right and then to the left, and then back to its original position.

11. The body is flexed laterally, as far as possible, first to the one side and then to the other, and afterwards restored to its original erect position.

12. The patient, standing with the feet side by side and supporting himself by leaning with one hand upon any object, flexes the opposite thigh as far as it is possible, and afterwards extends it until the feet are again side by side; then, leaning on the other hand, he carries out a similar movement with the other thigh.

13. The patient, supporting himself by one hand, as in No. 12, and the knee being kept straight, each leg in turn is raised as high as possible in front of the body, and then in the same way behind.

14. Supporting himself by placing both hands in front on the back of a chair, the patient first flexes one leg and then the other upon the thigh as far as he can.

15. Each leg in turn is abducted as far as possible, the knees being kept straight, the patient resting on one or other hand the while.

16. The arms, held horizontally outwards, are rotated forwards and backwards at the shoulder joint.

17 and 18. Flexion and extension, first of the wrists, and second of the ankles.

In resisting these movements the operator places the palm of his hand on that side of the patient's limb or body towards which the movement is to be made. In the movements of the wrist the operator closes his thumb and forefinger round that joint.

ARTIFICIAL NAUHEIM BATHS

The weak bath which is used at the commencement of the treatment can be made by dissolving 1 lb. of sodium chloride and 1½ oz. of calcium chloride in 10 gallons of water at a temperature of 95° F. The duration of this bath should be five minutes. The strength of the bath is gradually increased

until the full strength of 3 lb. of sodium chloride and 4½ oz. of calcium chloride to 10 gallons is reached. The duration of the bath is also gradually lengthened to fifteen or twenty minutes and its temperature gradually lowered till it reaches 85° F. To make the effervescing bath, sodium bicarbonate and hydrochloric acid are added to the full strength of the brine bath. After dissolving 3 lb. of sodium chloride and 4½ oz. of calcium chloride in 10 gallons of water, 2 oz. of sodium bicarbonate is to be thoroughly mixed with the water; then, just before the bath is used, 3 oz. of hydrochloric acid is added from a bottle opened at the bottom of the bath; or Sandow's acid tablets and alkaline powders may be used instead. The strength of the bath is increased day by day until 8 oz. of the alkali and 12 oz. of the acid are used for a bath of 10 gallons.

A porcelain bath is desirable, but if this is impracticable the alkali should be in slight excess.

CHAPTER XIX

TREATMENT OF FUNCTIONAL AFFECTIONS OF THE HEART: PALPITATION — CARDIAC PAIN—ANGINA PECTORIS

PALPITATION: Its Nature and Causes—"Irritable Heart"—Tachycardia—"Paroxysmal Tachycardia"—"Bradycardia"—Stokes-Adams Syndrome—Arrhythmia—*Treatment*—Digitalis in Auricular Fibrillation—Open-air Life—Regimen—Diet—Cardiac and other Tonics—Bromides for Sleeplessness—Antacids—Aperients—Hysterical Cases—Paroxysmal Tachycardia—Remedies—Bradycardia and Stokes-Adams Disease—Remedies.

CARDIAC PAIN: "Submammary Pain"—Its Nature—Value of Local Counter-irritation—Digital Exploration of Præcordial Region—Cases of Cardiac Pain—Relation of these to Cases of True Angina—Aortic Strain.

ANGINA PECTORIS: Symptoms—Causes—Classification—Objections to the Vaso-motor Hypothesis—*Causal Indications for Treatment*—Hygienic Treatment—Treatment of Dyspeptic States—Avoidance of Toxic Agents—Removal of Gouty, Syphilitic, or other Blood Contamination—Importance of Elimination—Medicinal Measures in the Intervals—In the Paroxysms.

Additional Formulæ.

WE must next consider the treatment of those affections of the heart which are regarded, mainly, as disorders of cardiac function, and which may occur independently of the existence of structural disease. It must, however, be obvious that the presence of structural disease is no impediment to the manifestation of disorders of function, and that, although we are now about to consider these affections as distinct and independent morbid states, they do, very commonly, coexist with structural disease of the valves and walls of the heart. Disturbance or disease of the conducting media of the heart, upsetting the equilibrium of irritability which subsists between the centres that respectively initiate contraction and propagate it in the heart, has an important causal connection with some conditions of abnormal rate and

rhythm. A weak heart is, as a rule, unduly irritable as well. In many cases, as for instance in those of emotional origin, we must attribute the condition to some disturbance or other of extracardiac innervation, and commonly of its sympathetic supply.

Palpitation

Palpitation may be described as a consciousness of the heart-beat; an "irregular or forcible action of the heart perceptible to the individual."

The heart-beat is usually in health unconscious, except that in most persons the heart-beat may be rendered conscious by the assumption of certain positions. There are many healthy individuals who on lying down at night in bed on the left side become conscious of the heart-beat. The explanation would seem to be that the heart is brought more closely in contact with the chest wall. Palpitation usually means that the heart-beat is not only conscious, but that it is actually increased in force and rapidity. Cases are, however, encountered, though rarely, in which the palpitation is wholly subjective, and although the patient may complain of the most distressing feelings of beating and throbbing at the heart, on physical examination the heart is found to be acting with perfect regularity.

But commonly the complaint of palpitation is accompanied by increased rapidity and force of the cardiac contractions; the patient's body may sometimes be seen to shake with the force of the heart-beat; and at the same time the carotids throb violently. There is a sense of oppression and discomfort in the cardiac region, a feeling of fullness in the head, of giddiness or faintness, and even an apprehension of impending death.

Palpitation as a morbid condition is commonly referable to some disturbance of sympathetic origin. Sometimes, however, it is an early warning of commencing exhaustion of the muscular force of the heart. Exceptionally palpitation is combined with

arrhythmia, the stimulus to contraction arising at some abnormal position.

Emotional disturbances of any kind will induce palpitation in many persons, but especially in the feeble and excitable, so that it is much more common in females than in males. Anæmia and chlorosis, and all debilitating influences, certainly predispose to, if they do not actually cause, palpitation.

Excessive mental labour, together with sleeplessness, will give rise to palpitation. But it must be remembered that palpitation is itself a cause of sleeplessness by the quickened circulation through the brain which it produces, as well as the discomfort attending it. The palpitations observed in both sexes about the age of puberty are frequently associated with hysteria, sexual excitement, or masturbation.

Hyperlactation has been mentioned as a cause. It is especially prone to accompany neurasthenic states, disorders of menstruation, and the troubles of the climacteric period.

A combination of mental excitement and excessive muscular effort seems to have been the cause of the "irritable heart" observed by Da Costa among the young soldiers in the American Civil War. The chief symptoms were palpitation with greatly quickened pulse, dyspnœa, and more or less cardiac pain.

Dyspeptic states and flatulence are frequent causes of palpitation. In such instances, not only have we to consider reflex influences on the heart itself or on its innervation, but when there is over-distension of the stomach and intestines by gas or by excess of food or drink, as in great eaters and drinkers, then there is the further disturbing influence of upward displacement of the heart by the pressure of the distended stomach and intestines upon it. The palpitation associated with constipation is often of this kind, although it has been regarded as reflex and referred to the irritation of the abdominal nerves by scybala.

Palpitation is sometimes an evidence of hyperthyroidism, and is almost always present in exophthalmic goitre.

Whatever causes diminished blood-pressure, by dilating the small arteries and lessening the obstruction the heart normally has to overcome, may excite palpitation, as alcoholic intoxication, exposure to excessive heat in hot baths, Turkish baths, etc.

The heart, in certain persons, is prone to be disturbed by certain substances in common use, such as tea (especially certain kinds, as green tea), coffee, tobacco, etc. These sometimes disturb the cardiac rhythm and produce irregularity and intermission together with vague, uncomfortable feelings in the region of the heart, without causing actual palpitation. And it is generally their excessive or prolonged use, not their moderate or occasional use, that causes these disturbances of cardiac function.

Tachycardia is the name that has been invented to distinguish the *rapid heart* from the heart affected by palpitation. It is used to express a fact which is common enough, viz. that some persons habitually have a rapid pulse-rate, just as others have a slow pulse-rate. Emotional influences, such as fright, worry, and anger, often induce tachycardia, and when this condition arises at the menopause it would seem to be of the same nature. Protracted over-exertion is another cause: we have seen it after injudicious bicycling feats. Dyspeptic disturbances sometimes excite heart-hurry; so do the poisons of tobacco, alcohol, tea and coffee in excess. Increased heart-rate is a normal accompaniment of fever, and may be due to toxic influence on the nervous system, or to enfeeblement of the cardiac muscle. Any condition of cardiac exhaustion may cause tachycardia: it is seen in its extremest form at times in the terminal condition of cardiac failure, known as auricular fibrillation. In rare instances tachycardia has resulted from structural lesions of the medulla, or from pressure on the vagus nerves.

Paroxysmal tachycardia is the term used to express the fact that certain persons suffer from rapid action of the heart occurring in paroxysms, generally associated with palpitation. The pulse-rate may rise to 200 or even 300 beats per minute. The attacks may come on suddenly and terminate with similar abruptness. Some patients suffer but little subjective disturbance, but in others profound prostration is experienced, not infrequently accompanied with dyspnœa and cardiac pain. The dyspnœa may be so severe as to suggest an attack of asthma. The outlook in paroxysmal tachycardia is, as a rule, bad, and repeated attacks over a period of several years are apt to induce cardiac exhaustion and failure. Occasionally slighter forms are encountered which may be permanently cured by removal of some obvious exciting cause. The immediate cause of these attacks seems to lie in the existence in the heart of some hyperexcitable focus, which responds excessively to stimuli that do not disturb the normal heart. Research has shown that it is in the auricle that such a focus is most commonly located.

Bradycardia is the name applied to unusual slowness of the pulse. It is the normal condition in some individuals.* It is sometimes present during a normal puerperium. As a morbid phenomenon it may be found in states of exhaustion from protracted acute and other debilitating diseases; in certain chronic dyspeptic states, and jaundice; in cardiac degeneration; occasionally in pulmonary emphysema; in uræmia and other toxæmic states; in certain diseases of the nervous system, apoplexy, tumours, sunstroke, etc.

The **Stokes-Adams** syndrome is a condition of bradycardia, usually associated with advanced arteriosclerosis and fibroid changes on the heart: many of the subjects also have aortic stenosis. It has also

* Napoleon is said to have had a pulse-rate of 40, and Talleyrand to have always had a very slow and intermittent pulse.

existed along with acute inflammatory or with syphilitic changes in the walls of the heart. The explanation of the slow pulse in these cases is that profound exhaustion or degenerative disease has affected the main conducting tracts in the heart, so that the ventricle, cut off from auricular stimulation, takes on its own independent slower rate. Disease of the auriculo-ventricular bundle of His has been demonstrated in some cases. A remarkable feature of the disease is the occurrence of syncopal attacks, in which the ventricular beat is temporarily arrested.

Arrhythmia is the term applied to irregularity of the heart's beat. The subject still remains one of considerable complexity, though much light has been thrown on it by the work of Wenckebach and Erlanger, and of Mackenzie and Lewis in this country. Mackenzie has shown that the vast majority of cases of arrhythmia may be referred to one or other of the three following groups: (i.) sinus arrhythmia; (ii.) extra-systoles; (iii.) auricular fibrillation.

Sinus arrhythmia seems to be due to influences acting upon the sinus node by way of the extrinsic cardiac nerves, either accelerating or inhibiting its discharge. The phases of respiration often have an obvious influence in its production, the rate rising with inspiration and falling with expiration. It is seldom a matter of serious importance, and is commonly seen in young nervous subjects, and sometimes in convalescence from recent sickness, especially after influenza.

Extra-systoles are premature contractions, originating either in auricle or in ventricle, independently of the normal stimulus of the sinus node. Extra-systoles may occur regularly or irregularly; as a rule they conform to some fairly constant type, and thus give rise to types of pulse which long ago received descriptive designations; when a small premature beat is not propagated to the wrist, the pulse is said to be *intermittent*. On auscultating the heart the extra-systole is readily heard following quickly

on another beat and succeeded by a pause, after which the heart gathers itself up, as it were, and responds in a single long loud contraction. By far the larger number of cases of arrhythmia are of extra-systolic type. The undue irritability of the heart that gives rise to these extra systoles is sometimes a purely nervous phenomenon of no moment whatever; or it may be referable to one or other of those numerous extrinsic causes of cardiac disturbance that we have already considered in discussing palpitation and tachycardia; or it may be associated with definite disease of the heart.

Auricular fibrillation is a condition in which the separate bundles of auricular muscle are in such an excitable condition that they seem able to initiate innumerable independent stimuli, which fall in a shower upon the auriculo-ventricular node, and passing on to the ventricle excite the extremest irregularity of the pulse, and a form of irregularity which is constantly varying. At first, as a rule, the pulse besides being irregular is unduly rapid, and if this condition persists cardiac failure supervenes sooner or later. But at times the node seems to become exhausted and unable to transmit all the stimuli that reach it, and the rate of the pulse falls correspondingly. Auricular fibrillation is always an evidence of extreme muscular weakness, and is most characteristically seen in the terminal stages of mitral stenosis or of myocardial degenerations. Cases are, however, met with in which the condition has persisted for several months or more under appropriate treatment. The condition is readily demonstrable in tracings from the jugular vein, or by means of the electrocardiograph. The symptoms associated with it are those of cardiac failure.

The **treatment** of these disturbed states must now be considered.

The first and most important indication is to endeavour to seek out the cause of the disturbance, and if possible to remove it. When it is clearly

dependent on emotional excitement and disordered mental states we must take measures to subdue them, and especially we must reassure the patient, and try to convince him that the symptom is not a dangerous one. When it is associated with debility we must prescribe appropriate tonic remedies. When due to sexual aberrations or hysterical conditions we must frankly explain the cause of the malady and point out the only sure method of cure. When produced by excess of work, physical or mental, we must insist on the remedial effect of rest: this is particularly called for in cases arising at the menopause. When accompanying disorders of the female pelvic organs, those must be taken in hand and properly treated. If dependent on dyspeptic states, flatulent distension, and constipation, dietetic and medicinal measures must be directed to their removal. When clearly traceable to the toxic influence of some habit, such as the excessive use of tea, coffee, or tobacco, or thyroid extract preparations, this must be forbidden. When it is connected with some organic lesion of the heart, the remedies already set forth as appropriate to them must be applied: when auricular fibrillation is present, complete rest should be insisted on: and if the pulse is rapid, great benefit may be derived from full doses of digitalis. And finally, when it is a symptom associated with incurable lesion of the nervous system, we must have recourse to certain sedative agents, which may at least afford temporary relief.

Nothing is perhaps more generally useful and applicable to many forms of disturbed action of the heart than regulated exercise in and free exposure to the open air. In debilitated states, when the cardiac muscle is weak, much walking exercise is undesirable, but gentle driving exercise is most useful, and sitting or reclining in the open air has both a tonic and a sedative influence. Irregularity often disappears with these measures alone. Bodily restlessness, which in some persons accompanies mental disturbance, must, however, be kept under control, and nine or ten hours'

rest in bed should be insisted upon. In many nervous cases judicious hydrotherapeutic treatment, such as warm affusion applied generally, followed by cold sprinkling, especially along the spine, which may in time be altered to a brief cold douche, succeeded by brisk friction of the skin, will be found most beneficial. Good results sometimes follow a course of artificial Nauheim baths.

In these nervous patients nothing is more certainly opposed to successful treatment of their coexisting dyspeptic troubles than the "little and often" method of feeding by which they attempt to still their abnormal "cravings." We should, therefore, insist on due and sufficient intervals between meals; if we have evidences of a slow and feeble digestion we should allow at least five, and often six hours to intervene between successive meals. Nothing whatever should be permitted between meals beyond a cup of hot water with a few teaspoonfuls of milk, or a small cup of light broth or consommé. Tea, coffee, tobacco must be prohibited, but small quantities of sound wine and pure spirit, well diluted with water, may be permitted at mealtimes. The meals themselves should consist of a moderate amount of easily digestible and nourishing food, chiefly animal, previously minced or pounded if any masticatory carelessness or defect exists, and a small quantity of vegetable purées. The fluid at meals should be strictly limited.

It may be necessary in neurasthenic cases, with anorexia and great inanition, to apply the Weir-Mitchell system rigorously.

In cases associated with anæmia or exhaustion, especially after acute illnesses, much benefit will follow the administration of some suitable form of iron combined with strychnine and arsenic. Strychnine and nux vomica act better as cardiac tonics in many of these cases than digitalis or strophanthus. Strophanthus is specially recommended by some for relief of tachycardia. We have ourselves encountered a few cases in which the response to strophanthus was striking and

immediate, but we are confident that others will find, as we do, that this is the exception and not the rule. Belladonna is thought by some to be more useful than digitalis or strophanthus, especially if combined with sodium bromide.

The following formulæ are useful :—

℞ Ferri et quininæ citratis	... ...	gr. xl ad lxxx.
Liquoris strychninæ	... ...	♏xl.
Spiritus chloroformi	... ...	ʒij.
Acidi hydrobromici	... ...	ʒij.
Aquæ	... ...	ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls twice or three times a day, an hour before food.

Or this :—

℞ Ferri et ammonii citratis	... ...	gr. lxxx.
Tincturæ nucis vomicæ	... ...	♏lxxx.
Sodii bromidi	... ...	gr. lxxx.
Spiritus ammoniæ aromatici	... ...	ʒiv.
Aquæ	... ...	ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls three times a day.

The same combinations of drugs will be found suitable for cases of toxic origin, while at the same time we must be careful to keep all the channels of elimination active.

In more distinctly neurotic cases valerianate of zinc and iron will be found very valuable. A grain of either of these made into a pill with ½ grain of extract of nux vomica may be ordered twice a day, an hour after food. It may often be desirable, when sleeplessness accompanies palpitation, to give a full dose of bromide at night; 15 to 30 grains of sodium or potassium bromide in 1½ ounces of chloroform water should be ordered at bedtime: it is generally advisable at the same time to recommend the patient to sleep with his head and shoulders well raised on pillows, so as to prevent the abdominal contents from pressing on the cardiac region, and to allow of nothing but a little soup or other light food for some hours before bedtime.

When palpitation accompanies organic disease of the heart, or is associated with cardiac hyperæsthesia, as evidenced by tenderness on pressure over the cardiac apex, a plaster of belladonna or opium applied over the præcordia is of great use.

In a troublesome case of palpitation accompanying aortic and mitral disease in a young woman, we found painting strong iodine paint along the course of the pneumogastric nerves in the neck was quickly followed by relief of the palpitation and reduction of the pulse-rate from 120 to 80. Friction over the upper part of the spine will sometimes slow the heart.

When symptoms of chronic gastric catarrh are associated with palpitation, a gastric sedative and antacid should be prescribed, such as—

℞ Bismuthi carbonatis ... ... gr. x.
Magnesii carbonatis ... ... gr. v.
Sodii bicarbonatis ... ... gr. x.
Aquæ laurocerasi ... ... ʒj.
Pulv. tragacanthæ compositi . ... q.s.
Aquæ caryophylli ... ... ad ʒj.

Misce, fiat haustus. To be taken an hour before food twice a day.

Soda-mint tablets are a handy preparation for the same purpose.

Suitable aperients should also be ordered in case of constipation, and in obstinate cases with retained scybala, enemata of soap and water, with a few tablespoonfuls of olive oil added, should be administered with a long tube. In hysterical cases a combination of valerian and bromides often proves useful—20 grains of sodium or ammonium bromide with ½ dram of the ammoniated tincture of valerian and an ounce of chloroform water may be given for a dose. Gibson speaks well of calcium bromide in half the doses given of the alkaline bromides.

Various expedients have been recommended for the immediate relief of attacks of palpitation and heart-hurry, such as an ice-bag over the cardiac region, a tablespoonful of brandy in a little water (dangerous on account of the risk of exciting a

craving for alcohol), a mixture of sal-volatile and compound spirits of ether with tinctures of lavender, henbane, cannabis indica, etc. Above all, the physician should adopt a tone of calm reassurance.

Broadbent observes that "to arrest an attack of palpitation it is sometimes only necessary to take a dozen deliberate deep breaths."*

For paroxysmal "heart-hurry" the bromides in full doses have been found useful; digitalis and strophanthus are seldom of value; an ice-bag or Leiter's tubes over the heart, and the application of the continuous galvanic current along the course of the vagus nerve trunks in the neck, have also been recommended. Occasionally an attack may be cut short by drawing deep breaths. One of our patients was able to cut short an attack by exciting vomiting, but the administration of an emetic produced alarming symptoms of collapse. Recumbence should be insisted upon during and for some hours at least after an attack. The danger of having recourse to morphine will be apparent but must sometimes be faced. This condition is, however, not very amenable to medical treatment, and we must usually be content to support the heart by absolute rest and diffusible stimulants until the paroxysm subsides spontaneously. If the paroxysm persists, symptoms of cardiac failure will arise and call for appropriate treatment. Distressing dyspnœa may require the inhalation of oxygen. The slow pulse, when constitutional, needs no treatment, but individuals with this peculiarity require more active stimulation and a more supporting rêgime when attacked by any acute illness than others. When it is a symptom of cardiac exhaustion or degeneration it needs the same supporting and tonic remedies as we have already fully described. Iodides, in our experience, have proved useless, but should be employed in full doses where there is evidence of syphilis, and salvarsan or mercury may be given as well.

* "Heart Disease" (3rd edit.), p. 358.

Cardiac Pain

Before we pass on to consider that grave cardiac affection known as angina pectoris, it will be well to refer to less serious forms of cardiac pain which we encounter. All experienced practitioners are aware of the fact that when a patient complains of "pain at the heart" it is an expression frequently used very vaguely, and simply refers to the existence of pain about the anterior part of the chest on the left side, which may even not be of cardiac origin at all, but dependent on rheumatism, or intercostal neuralgia, or costal periostitis, or acute or chronic pleuritis, or some flatulent or dyspeptic state.

In recent years the researches of Mackenzie and Head have thrown much light on the nature of cardiac pain. The severe pain and tenderness associated with some forms of cardiac disturbance and disease is located not in the heart itself, but in the skin and superficial structures linked to it by nervous connections with the spinal cord. The spinal segments chiefly involved are those from the eighth cervical to the sixth dorsal, but strong impulses are apt to overflow these limits in each direction. The diseased or disordered heart sends an impulse, chiefly by its sympathetic connections, to some part of this spinal area. If the impulse is communicated to the brain, the sensation of pain is referred to the sensitive surface rather than to the heart, which is relatively insensitive. And if the impulse is not communicated to the brain, still the spinal segment remains in a state of unstable equilibrium, so that pressure on the associated cutaneous area elicits an exaggerated sensation of tenderness. That this is in the skin and not in the heart may be shown by raising the skin and gently pinching it between the finger and thumb. Over and above these painful areas in the distribution of the spinal nerves we find in heart disease areas of pain and tenderness in the frontal and temporal regions, and

referable to nervous intercommunications with the thoracic spinal nerves.

There is a particular form of pain frequently complained of by young chlorotic women who are at the same time the subjects of menstrual irregularities, and which is termed "**submammary pain.**" It is often associated with ovarian irritation and tenderness, especially on pressure over the left ovary. We have had occasion to believe that this submammary pain is, in some cases, partly cardiac, and not merely superficial. An attentive exploration of the region of the cardiac apex with the tip of the finger will often reveal the fact that this is the precise seat of the pain complained of, and firm pressure here with the finger-tip will greatly aggravate it.* With such patients you may press with moderate firmness on various parts of the surface of the chest with the tip of the finger without provoking any complaint of pain, but the instant the pressure falls over the cardiac apex the patient starts back with a decided expression of suffering. Dr. Balfour, in the first edition of his valuable lectures on "Diseases of the Heart," spoke of this "submammary pain" as "wholly external," but he modified this view in his second edition, and says: "In most the pain is truly cardiac in character." But it sometimes occurs in its most obstinate forms in young women who are not anæmic, but who suffer from ovarian irritation. When submammary pain is associated with anæmia it will disappear as the anæmia disappears, and will require the same treatment; but when it occurs in robust, florid girls, with sexual irritability, we have found the repeated application of small flying blisters over the cardiac apex and over

* Harvey had the opportunity of making some observations on the Duke of Montgomery, whose heart was partially exposed after the healing of a severe wound of the chest, and he convinced himself that the heart in a healthy state was entirely wanting in sensibility.

the painful ovary (almost always the left) the most effective mode of treatment.

Professor Peter pointed out that in some of these conditions of cardiac pain, certain distinctly painful spots may be made out on exploring the anterior surface of the chest with the tip of the finger. If there is an irritable condition of the myocardium, pain on pressure will often be found to exist in the fourth and fifth left intercostal spaces near the sternum, and also over the cardiac apex. In cases of "tobacco-heart" in middle-aged men, Peter noticed that pressure over a very limited point in the third left intercostal space, near the sternum, gave rise to acute pain, and he thought this pain corresponded with the auriculo-ventricular groove, and that it was probably due to a morbid condition of the ganglion of Remak, caused by tobacco. Conscious cardiac intermissions accompany this state of the tobacco-heart, as they also do some cases of coffee intoxication. The pain, on pressure, which is found to exist in some cases of disease of the aorta and its valves, in the second left interspace close to the sternum, and over the sternum itself at the same level, is, according to Peter, not due to the lesion of the aorta itself, but to a neuritis propagated from the diseased aortic tissues to the nerves lying on it.

In connection with the coexistence of valvular disease it is certainly noteworthy how much less frequently we have complaint of cardiac pain in mitral than in aortic cases, although cardiac discomfort, not amounting to severe pain, is common enough in mitral cases. The reason of this probably is, that in aortic disease the strain of the lesion falls on the left ventricle, while in mitral disease the chief stress is borne by the right ventricle. Now, the right ventricle is provided with an efficient safety-valve in the yielding tricuspid orifice, while the left ventricle possesses no such defensive mechanism.

The annexed diagram (Fig. 10) shows the situation of spots of well-marked tenderness on pressure in a case

of aortic valve disease under our care, together with signs of aortic dilatation. The patient (who had had four attacks of acute rheumatism) complained of pain at the heart shooting through the left breast to the back, and also of sudden pains across the chest, causing him to stop short when walking. He also had some dyspnœa, cough, and blood-stained expectoration. He was pale and emaciated. Pulse 104, small. This patient was greatly benefited by the following treatment, and the pulse was reduced to 88 : flying blisters, the size of a florin, over the upper sternal and præ-aortic

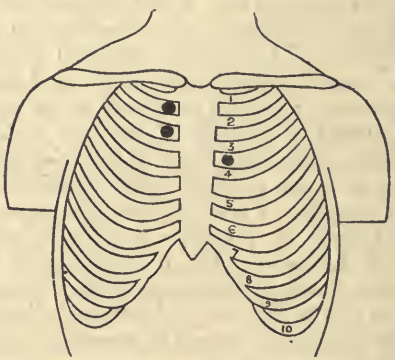

Fig. 10.—Painful spots in a case of aortic regurgitation.

region, 5 minims of tincture of digitalis, 10 grains of ammonio-citrate of iron, and an ounce of infusion of calumba, thrice daily.

In another case of aortic regurgitation in a lady 32 years of age, who had been under our observation for some years, she at one period, after a shock owing to the death of a sister, complained of much nervous distress and sleeplessness, but especially of pain in the cardiac region, shooting down both arms to the elbows, and aggravated by the least exertion ; also of palpitation ; pulse 120. There was in this case distinctly one, but only one, painful spot on pressure with the tip of the finger over the front of the

chest, and this was at the sternal end of the second left interspace. She was greatly benefited, and this tender spot disappeared, and the pulse came down from 120 to 80, by the same treatment as that just described, viz. counter-irritation over the præ-aortic region by means of flying blisters and a combination of digitalis and iron.

In another aortic case (obstructive and regurgitant murmurs), a young man 22 years of age, under our care in King's College Hospital,* complaint of cardiac

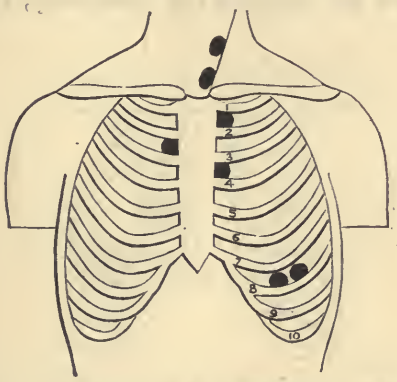

Fig. 11.—Painful spots in a case of aortic disease.

pain was a most notable symptom. The pain, commencing in the cardiac region, would shoot down the left arm, was at times very severe and prevented him from sleeping, and was much aggravated by exertion. Countenance pale and anxious, much cardiac hypertrophy, apex beat in seventh interspace $1\frac{1}{2}$ inches outside nipple line. Much general arterial thickening. The exploration of the chest and neck revealed several points where there was great tenderness on pressure. They are shown in the accompanying diagram (Fig. 11), from which it will be seen that

* This case was carefully noted by Dr. Silk, the then House Physician.

there are two points close together over the diffused apex beat, others in the first and third left interspaces close to the sternum, another in the second right interspace close to the sternum, and two points over the course of the vagus in the neck, just in front of the anterior border of the sterno-mastoid. This patient was greatly relieved by the following treatment : rest in bed, a diet composed largely of milk, small flying blisters over the base of the heart, small doses of digitalis with ammonio-citrate of iron, and sometimes with ether and ammonia, and occasionally, when the

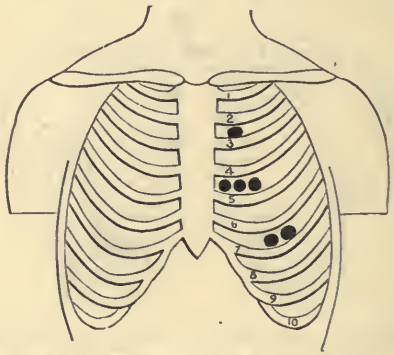

Fig. 12.—Painful spots in a case of mitral disease.

cardiac pain was very severe, hypodermic injections of morphine.

In another aortic case* somewhat resembling the foregoing, painful points were found on pressure over the vagus in the neck, as well as in the first and second left interspaces close to the sternum, and relief was at first experienced from counter-irritation ; but subsequently the patient was attacked at night with paroxysms of pain and dyspnœa of an anginal character, which were relieved by inhalation of nitrite of amyl.

* Carefully observed and noted by my former clinical clerk, Mr. C. G. Hodgson.

The preceding diagram (Fig. 12) shows the painful points noted in a case of mitral stenosis, with incompetence, in a female 32 years of age, who complained greatly of severe "pain at the heart," extending into the back between the shoulders. In this case, owing to the coexistence of fibroid disease with retraction of the left lung, the surface of the heart was largely uncovered. Cardiac pulsation was visible in all the situations of the painful spots, and doubtless some chronic inflammation of the cardiac muscle had con-

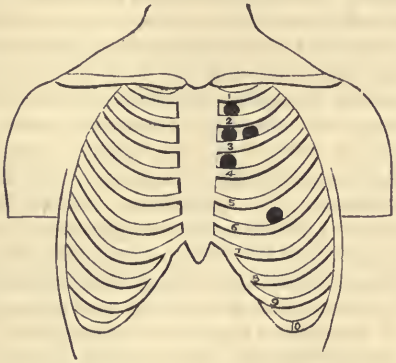

Fig. 13.—Painful spots in a case of functional cardiac disease.

ferred upon it a morbid irritability. Counter-irritation in the form of small flying blisters, rest in bed, occasional frictions with the mixed belladonna and chloroform liniments, small doses of digitalis and iron, led to the relief of pain, to regulation of the cardiac action, and to great improvement in the general health.

The above diagram (Fig. 13) shows painful points observed in a case in which the cardiac disturbance was purely functional. A housemaid, 25 years of age, accustomed to carry heavy trays upstairs, complained of "pains at the heart darting through the chest" and palpitation. She could not move without distressing

palpitation, accompanied with dyspnœa, and "throbbing at the heart." The pain was worse after food and on attempting to mount stairs. She suffered also from dysmenorrhœa, constipation, and flatulence. She had been in the habit of drinking a quantity of tea three times a day. Her cheeks were flushed, but her lips and gums were pale and bloodless. The heart's impulse was greatly exaggerated, and the large vessels at the root of the neck pulsated strongly. There were no murmurs. On exploring the præcordial sensibility the following painful points were made out: one over the apex and others at the sternal end of the first, second, and third left interspaces. She was ordered to abstain from tea, and she was given 8 minims of tincture of digitalis, with ammonio-citrate of iron and infusion of calumba, thrice daily, and a daily dinner pill of aloes and nux vomica. She rapidly improved, the painful spots became less sensitive, and then disappeared; the pulse was reduced from 120 to 84, and in a month she was quite well, and the pain and sensibility had disappeared. This was a case of disturbed cardiac innervation with hyperæsthesia, induced by excessive tea-drinking, and augmented by the severe muscular efforts she had to make.

The affinity between these minor attacks of cardiac pain and the graver cases of angina pectoris is illustrated by another case, a housemaid also, aged 21, who complained of severe pain in the cardiac region, brought on by carrying heavy trays upstairs. The pain came on suddenly two or three times a day, and extended down the left arm, which, she said, "went stone cold." She suffered also from loss of flesh and headaches. Pulse 100, feeble. No murmurs. There was marked tenderness on pressure in the third left interspace, extending from the sternum outwards for three-quarters of an inch. There was *distinct localisation* of *extreme tenderness* over this spot. There was also a tender point, but less sensitive, over the apex. The patient was treated with iron and calumba thrice daily, and chloroform and belladonna liniment

locally. This, after a month, had given but little relief. Five grains of potassium bromide were then added to each dose of the mixture, and a flying blister, the size of a florin, was ordered to be applied for two hours at a time over contiguous spots at and near the sternal end of the third left interspace. Under this treatment the tender points disappeared, and the pain in the cardiac region and left arm disappeared also.

This case of cardialgia was probably induced by over-fatigue and cardiac strain, and it had many points in common with angina pectoris. It is noteworthy how in this and other like cases the tenderness seems to be specially localised about the sternal end of the second or third left interspace, and how speedily the symptoms were relieved by counter-irritation over this spot. Another case which came under observation before we had adopted this practice of localising hyperæsthesia is of interest as having apparently the same causation as the preceding. The patient was a waitress, 29 years of age, and had in her occupation to carry heavy trays upstairs. The attacks of præcordial pain were more distinctly paroxysmal and nearer still in character to those of true angina, and the case terminated fatally after a few months' illness.

The causal relation between these last three cases is obvious. They were all young women in fairly good health, with no antecedents leading to cardiac disease, save that they were all engaged in the same occupation, and all complained of the effects of carrying heavy trays upstairs. In the first and slightest of these cases the cardiac exhaustion was undoubtedly aggravated by the abuse of tea. In all three, and especially in the last two, the symptoms complained of bore a striking likeness to one another. In neither of them, when first seen, was there any definite cardiac murmur. May we not trace the varying effects of cardiac or vascular strain in each of them? As we have already pointed out, in severe and sustained muscular efforts there is increased action of the cardiac muscle on the one hand, and increased

resistance, at the periphery, of the arterioles and capillaries on the other. If the cardiac muscle is ill-nourished and weak from coexisting anæmia, or from any toxic cause, then the ventricular wall may yield and become dilated, and we may get palpitation and pain from fatigue, malnutrition, and exhaustion of the cardiac muscle. But if the tone of the cardiac muscle is fairly good and its contractions are sustained and vigorous, then we should expect the strain to be chiefly felt at the commencement of the aorta, which in sustained muscular efforts has to bear a two-fold distending influence: it has to bear the augmented impetus of the ventricular outflow, increased both in force and frequency, as well as the increased resistance in the peripheral vessels. In these circumstances it is not remarkable that it should become the seat of chronic inflammatory changes; or a portion of its wall may yield and become the seat of aneurysmal dilatation, as was most likely the case with the last patient.

Angina Pectoris

The consideration of the preceding cases of cardiac pain may possibly help us to the due understanding of the pathology and treatment of angina pectoris, which we must now examine.

The **symptoms** of the graver attacks of angina pectoris—those of the minor forms will be gathered from the preceding cases—are well known. The attack is prone to occur, especially on the first occasion, on the patient ascending some rising ground or making some slight muscular effort after taking food. The pain, which is very severe, suddenly seizes the patient in the sternal region, and is accompanied by a feeling of constriction of the chest, as though it were compressed in a vice; the pain shoots through to the back and down the left arm usually, but sometimes also down the right. These symptoms are due to intense stimulation of motor and sensory nerves connected with that portion of the spinal cord which has been rendered explosively irritable by the

stimuli showered upon it from the weak and labouring heart. The agony is so great that the patient stands motionless, dreading sudden dissolution, and fearing to draw a breath, although the respiration is perfectly free. The face is usually pale and the hands are cold. The pulse is very variable in character, sometimes weak and irregular, sometimes quite regular, and sometimes of heightened tension. The attack, as a rule, passes off suddenly, after a few minutes or even seconds, but it may last much longer, with varying intensity, or may assume the form of a series of paroxysms. As the attack passes off there is usually some eructation of gas, and often a copious discharge of urine. Areas of tenderness frequently persist after the attack, in the chest, neck, or arms, in fact in parts indirectly connected with the sympathetic nerve supply of the heart. The attacks may occur only at long intervals, or they may be of frequent occurrence in the more serious forms. Mental emotion is often an exciting cause, and so are physical exertion and errors in diet, and dyspeptic states; distension of the stomach with flatus being especially prone to induce an attack. Unless, as is most frequently the case, there is serious disease of the heart, the health during the intervals between the attacks may be quite satisfactory. Although, in the greater number of cases, the attacks are apt to follow physical exertion and emotional excitement, it is not so in all cases; some of the most serious cases have occurred when the patient has been at rest, or have actually awakened him from sleep.

The classification that has been attempted of cases of angina pectoris, and their separation into distinct groups, appear to us somewhat forced and unnatural. We regard angina as a neurosal incident of cardiac disease, organic or functional—most frequently the former. It is not a disease in itself; it is a phenomenon or manifestation of disease. The cardiac trouble underlying the anginal attacks may vary in

its nature, but the anginal attacks maintain their resemblance to one another, differing only in their severity. We do not admit the *pseudo*-angina of some authors. Hysterical imitative anginas, however, certainly occur. But, as the cases we have quoted conclusively show, there is simply a gradation of severity and curability between simple cardiac pain and the so-called cases of pseudo-angina and those of true angina. In many, the graver cases of angina, we believe, there exists a serious organic cardiac or vascular lesion, although not always detectable. Disease about the mouths of the coronary arteries and degeneration of the heart muscle are the most constant lesions found at autopsy. In the milder or curable forms we have simply to do with a condition of cardiac exhaustion induced either by temporary conditions of cardiac malnutrition or cardio-vascular strain; or associated reflexly with disturbance of other organs; or brought about by states of blood contamination; and in this last case it may be associated with vaso-motor excitement and increased arterial tension. We object to the term *vaso-motor* anginas as resting on an hypothesis that is not by any means established or consistent with extended clinical observation. We have seen reason to regard the heightened arterial tension and "vaso-motor spasm" which has been assumed by some physicians to be the cause of anginal attacks as merely an incident of the same —an aggravating incident, no doubt, but not bearing a causal relation to the origin of the attacks. On further clinical observation it will be found that heightened arterial tension is a frequent incident, probably of a reflex nature, in other neuralgias, and notably in neuralgia of the branches of the fifth nerve. We have seen in patients, in other respects in perfect health, and free from neurotic tendencies, an attack of neuralgia of the superior maxillary nerve from dental irritation attended with marked increase of vascular tension, with a rise of 20 to 30 in the pulse

rate, and the attack passing off with an excessive flow of clear urine.

It would seem that the shock or irritation of certain kinds of pain is able of itself, in some instances, to raise vascular tension to a remarkable degree, and we believe that in those cases of angina in which the arterial tension has been found to be increased (and there is no evidence that it is so in all cases, or even in the majority), this augmentation of vascular tension will be found to be a sequence, not a precursor, of the attack, a consequence of the shock of pain, a reflex irritation of the vaso-motor centres.

Our present object, however, is to seek for **indications for treatment,** and we must, therefore, briefly consider the known modes of causation of attacks of angina pectoris. And, first, with regard to those graver cases which are associated with serious structural disease of the heart and vessels. Now, when we consider that in by far the greater number of deaths from organic disease of the heart, in which we find all the various lesions present that have been found in fatal cases of angina, yet no true anginal attacks have ever been complained of, we must admit that there is some additional circumstance needed to account for the angina. Certainly, obstructive disease of the coronary arteries has been found associated in a considerable number of cases with fatal attacks of angina, but extreme aortic regurgitation, extreme degeneration of the myocardium, and extreme dilatation of the cavities of the heart have no necessary causal relation to attacks of angina. The most serious forms of angina seem to have a complex causation: first, there must be a neurosal element, the cardiac nerve endings suffer irritation, and a reflex præcordial attack of pain of a very intense character is excited; this may be communicated to the great medullary centres and result in disturbance of the motor equilibrium of the heart, or in widespread vaso-motor phenomena. In this neurosal factor

would seem to lie the explanation of the fact that conditions apparently the same in other respects will induce angina in one subject and not in another. And further, the heart muscle in a state of grave *exhaustion* is shocked by the attack of nerve pain, and if some reflex arterial spasm should be excited at the same time, it will have to encounter an augmented peripheral resistance as well. In such cases the rapidity of the fatal issue is no argument against the neurosal nature of the angina. Here there is a complex association of depressing causes in the struggle with which the heart may fail and sudden death occur; or it may struggle successfully with the earlier attacks, but as its struggling power becomes exhausted it must finally succumb.

In the next place let us inquire what is the causation of the less grave and more entirely remedial forms of angina. In these also the causation is in many instances complex, though exhaustion of the heart muscle is an invariable factor. We may have a cardio-vascular system feeble and ill-nourished from anæmia submitted to undue strain, as in the cases we have previously described; or we may have some intoxication, such as that of tea, tobacco, alcohol, syphilis, gout, or some intestinal toxin, irritating and enfeebling the heart, and perhaps causing central irritability, increasing peripheral resistance, and so exciting anginal attacks, which may altogether pass away and be completely recovered from. *Vaso-motor spasm* as a unique cause of attacks of angina must, we think, be set aside as inconsistent with extended clinical experience. Cases of angina pectoris, both of the milder and graver forms, occur without any evidence of vaso-motor spasm or of heightened arterial tension, and the conditions of heightened arterial tension, together with a feeble cardiac muscle, very commonly coexist without any tendency whatever to the development of anginal attacks; and we have already given reasons for concluding that when anginal attacks are found associated with heightened arterial tension the

latter may be a reflex consequence of the cardiac pain. The argument in favour of a vaso-motor causation of anginal attacks has been inferred from therapeutic experiment and the relief to the paroxysm that has attended the use of agents which cause arterial relaxations. It is forgotten that, in the absence of any vestige of vaso-constriction, vaso-dilators will diminish the work that the heart has to perform, and in the large majority of all cases of angina there exists some temporary disproportion between the work required of the heart and its power to do it. Balfour and Grainger Stewart attributed the efficacy of the nitrites to a supposed anodyne action, but no evidence is forthcoming that they really possess any such anæsthetic property. We have seen a patient with his countenance purple and the peripheral vessels intensely dilated under the influence of nitrite of amyl, without the slightest relief to his anginal attack. But we readily admit that nitrite of amyl and its allies do relieve many anginal attacks, and, to a certain extent and in some cases, by the lowering of the vascular tension they produce, without, however, admitting that there is a direct causal relationship between the anginal attacks and heightened arterial tension.

With these preliminary considerations we are now in a position to formulate the **indications for treatment.** These are :—

1. To improve the general nutrition, to avoid all strain, physical and emotional, and so to relieve cardiac exhaustion. Everything should be done to encourage and reassure the sufferer.

2. To relieve dyspeptic conditions and flatulent or fæcal distension of the stomach and intestines, if present.

3. To forbid the habitual consumption of agents which may exercise a toxic action on the heart, as tea, coffee, tobacco, alcohol, etc., or which may introduce or develop toxins in the alimentary canal.

4. To avoid and remove any gouty and other blood

contaminations. In this connection the Wassermann reaction may afford valuable information.

5. To give such tonic remedies as may improve the cardiac tone and lessen existing tendencies to cardio-vascular degeneration, or exhaustion.

6. To relieve the paroxysmal attacks by sedatives and stimulants.

1. Anginal attacks occurring in persons who present signs of anæmia, and defective nutrition generally, must be encountered, in the first place, by attention to **hygienic measures.** Such patients must be removed from all causes of physical or mental strain. Their life must be temporarily one of complete repose of mind and body—a repose alternated with gentle physical exercise, always stopping short of the slightest fatigue, and carefully graduated to individual capacity. It is good for them, however, to be much in the open air, driving, sailing, or reclining, and in a mild climate, when possible, so that they shall be protected from the injurious effects of cold, exposure to which certainly favours the occurrence of these attacks, not only by lowering the nervous force, but by checking free cutaneous circulation and elimination. When exercise is impossible, massage and gentle resistance exercises may be of service. Light respiratory gymnastics have found favour with some. Much attention should also be paid to the diet. The general principles of diet, which we have already considered in the treatment of chronic valvular lesions, are as a rule applicable. It should be of the most nutritious nature, so far as is consistent with ease of digestion. An almost exclusively milk diet will be found very serviceable in many cases. When the digestive powers are greatly weakened it may be necessary to have recourse to predigested foods, or to give with the foods some artificial digestive agent, such as pepsin or pancreatin. We have found a wineglassful of cream mixed with the same quantity of hot water, and a teaspoonful of sal-volatile added, an excellent food on getting up in the morning. The

lighter kinds of fish—soles, whiting, flounders, etc.—simply grilled, and eaten with a squeeze of lemon and plain uncooked butter, are excellent; lightly boiled or poached eggs are permissible; and also good consommé, flavoured with vegetables; the lean of fresh meat, well minced and lightly cooked, is most digestible and nourishing; fresh vegetables in the form of purées are useful, and so is the pulp of cooked fruits, as affording the necessary variety in the food and promoting the action of the bowels. Light milk puddings are also commendable, but they should be taken alone, not together with other kinds of food. We should see, too, that a sufficient quantity of pure water, and preferably warm, is consumed, for eliminative as well as assimilative purposes.

2. This first indication cannot, however, be thoroughly carried out without due regard to the second, viz. to relieve **dyspeptic conditions** and flatulent and fæcal distension of the stomach and intestines. The coexistence of dyspeptic states must be treated in accordance with the principles already laid down in another chapter. An alkaline bitter stomachic, composed of sodium bicarbonate, nux vomica, and calumba, an hour before the two principal meals, will be found valuable; or a combination of powdered rhubarb with carbonate of ammonia and peppermint, an hour or so after meals. Or in other cases a dose of dilute hydrochloric acid in compound infusion of orange-peel after food, with the addition of a few grains of pepsin, may be given. Flatulent distension during digestion will often be effectually relieved by a pill containing a grain of thymol or menthol, or a drop of creasote taken directly after food, or if the condition is more urgent by swallowing a 3-minim *perle d'éther*. Abdominal massage is at times a serviceable remedy. Regular evacuation of the bowels is most essential—checking, as it does, the formation of injurious toxins in the intestine, eliminating waste substances, and relieving abdominal distension. For some persons the best aperient is a dinner pill,

containing a grain or two of aloes, half a grain of powdered ipecacuanha, a grain of nux vomica powder, and a grain of soap; this may be taken before or after dinner. Should such a pill prove insufficient, it may be followed by a teaspoonful of Carlsbad or Homburg salts in half a tumblerful of hot water the next morning. In cases where there is a sluggishness of liver, with bile-stained conjunctivæ, a few grains of blue pill, or $\frac{1}{3}$ or $\frac{1}{2}$ grain of calomel at bedtime, with 2 or 3 grains of compound rhubarb pill, may take the place of the dinner pill.

3. The next indication is also an important one; for certain of the slighter forms of angina are no doubt dependent on, and the more serious forms may be provoked by, the habitual use of certain substances which come, in course of time, to exercise a toxic action on the heart. The action of these toxic agents is all the more subtle because they may be taken for many years without apparently producing any injurious effect, and it is often difficult to convince a patient that what he has so long done with impunity has at length become injurious. This is particularly the case with **tobacco**, the toxic effects of which on the heart are often delayed until, or even after, middle age, when they will perhaps somewhat suddenly make themselves felt. With regard to alcohol, it is singular to observe how in different individuals its toxic and degenerating influence will sometimes fall on one organ, and sometimes on another. The cardio-vascular system in some persons is especially prone to undergo serious degenerative changes under its influence, while in others it almost entirely escapes, and hepatic and gastric troubles more especially arise, and in women the peripheral nervous system is most prone to be affected; but whenever anginal symptoms arise, we should always insist either on complete abstinence from alcohol, or on its very sparing use in a very dilute form. Tea and coffee are often provocative of the slighter manifestations of cardiac pain and discomfort, and their effect is prone to be aggravated by emo-

tional disturbance. All these agents must be forbidden so long as any tendency to anginal attacks exists.

4. The fourth indication is to remove and avoid any gouty and other blood contamination. The value of **elimination** in many cases of angina pectoris is universally admitted; and we desire to emphasise the importance of a free evacuation of waste products from the system. When renal elimination is defective from the coexistence of renal degeneration we must maintain a free action of the bowels. When the kidneys are sound, the free use of pure water or a suitable mineral water, having some slight stimulating action on the kidneys, may avoid the necessity of free purgation; but in all cases a thorough daily evacuation of the bowels should be procured, and free action of the skin should be maintained by warm baths and frictions. In toxic and gouty cases, and in all cases of defective elimination, a careful and spare but adequate diet should be prescribed. Food should be taken in strict moderation, and should be carefully cooked and prepared so as to be made easy of digestion. Alcoholic stimulants should be avoided as far as possible; and when milk is not unacceptable to the patient a few weeks of an exclusively milk diet may be advantageous; but a diet of this kind requires the patient to remain entirely at rest during its adoption. Mercurials are of the greatest value both as eliminants and as intestinal antiseptics. If there is evidence of syphilitic taint, this must be appropriately treated.

5. In the fifth place we come to the consideration of the **medicinal treatment** of these cases. And first of the appropriate treatment in the intervals.

In anæmic cases and cases of temporary cardiac debility from removable malnutrition we shall find the milder preparations of iron combined with small doses of strychnine, such as we have already described in the early part of this chapter, of great service. In other cases we shall find **arsenic** of greater value than iron; there is a general consensus

amongst experienced physicians as to the value of arsenic in the treatment of cases of angina pectoris in the intervals between the paroxysms. Balfour asserted that arsenic is "indispensable in all forms of weak heart, accompanied by pain."* He advised that it should be given in the form of Fowler's solution, 3 to 5 minims, combined with iron and strychnine, twice a day, after food. We cannot too strongly insist on the value of strychnine as a cardiac tonic, especially in remediable states of cardiac asthenia. In highly neurotic cases much benefit may be derived from a combination of iron or arsenic and sodium bromide, in 10- to 20-grain doses. In the same class of cases the valerianate of zinc is also of great service; it may be given in grain doses in a coated pill thrice daily after food; and sometimes the combination of $\frac{1}{60}$ grain of phosphorus with it renders it a more valuable nerve tonic.

In some instances we have seen long periods of immunity from attacks apparently brought about by occasional recourse to a mild iron tonic, with 5-minim doses of tincture of digitalis, or a pilule of Nativelle's digitaline ($\frac{1}{100}$ grain). The idea of giving a combination of nitro-glycerine and digitalis, during the intervals, is a concession to the vaso-motor hypothesis of the mode of causation of the attack, to which we shall immediately recur.

Digitalis is not a very suitable tonic in any case where there is greatly heightened arterial tension—in such cases strophanthus or caffeine has the advantage over digitalis of not contracting the arterioles. Thyroid medication has been suggested when arterial tension is persistently high. Marchiafava speaks highly of theobromine in doses of 15 grains three times a day.

There is another remedy which is of very great value in the treatment of angina pectoris, especially when it is associated with obvious signs of cardio-vascular degeneration and of the gouty state, and that

* "Diseases of the Heart" (2nd edit.), p. 313.

is potassium or sodium iodide. It checks the progress of degenerative changes, it stimulates glandular organs, and efficiently promotes elimination, and it appears also to prevent vaso-motor irritability—all these effects may depend on its eliminative properties. It is one of the most efficient anti-neuralgic agents in other forms of nerve pain. It may be given in 5- to 15-grain doses, three times a day.

Huchard maintains that the iodides alone are capable of curing this disease. He prefers the sodium iodide.

In cases traceable to malarial intoxication, if arsenic fails to relieve, quinine should certainly be given; but in such cases evidence of arterio-sclerosis will usually be present, and will indicate the use of potassium or sodium iodide. It has been stated that cocaine, in doses of $\frac{1}{3}$ grain, twice daily, has the power of entirely preventing attacks of angina; but Huchard thinks it a dangerous drug in this disease.

6. It only remains to consider the indications for the relief of the paroxysmal attacks. Those who see in the causation of the anginal paroxysm the predominating influence of vaso-motor spasm consider the main indication for the relief of the paroxysm is to administer medicinal agents which are known to have the power of relaxing the arterioles, and so of lowering arterial tension, and, to that extent, to relieve the heart of a certain amount of the peripheral resistance it has to overcome. They therefore advocate the use of the **nitrites**, such as the nitrite of amyl, nitroglycerine, and sodium nitrite. That these agents do relieve the paroxysm in many cases of angina is certain; that they do so wholly by their action as vaso-dilators is less certain, for it must be remembered that nitrites affect *all* unstriped muscle alike.

Nitrite of amyl is best administered by inhalation. Glass capsules may be carried in the pocket in anticipation of an attack. A capsule containing 3 or 5 minims should be broken in a handkerchief, and inhaled. In some cases, however, it

entirely fails to relieve, although it may produce, in a most marked form, its characteristic effect of dilating the vessels. Nitro-glycerine is preferred by others, and it has been pushed until very large doses have been taken—as much as 35 drops of a 1 per cent. solution have been given and repeated at short intervals during an attack, and 7 minims three times a day in the intervals.* We should begin, however, with much smaller doses—1 to 2 minims of the 1 per cent. solution. Whitla recommends still smaller doses ($\frac{1}{1000}$) very frequently, so as to maintain the effect and avoid the severe headaches which often follow the larger doses. Sodium nitrite may also be employed for the same purpose; its effect is said to be more lasting than that of nitrite of amyl or nitro-glycerine. It is given in tablets of $2\frac{1}{2}$ grains; one to four of these may form a dose. At the onset of an attack, in addition to the inhalation of nitrite of amyl, which, owing to the rapidity of its action, is the most suitable remedy to start with, we may give some warm diffusible stimulant, such as 30 minims of sulphuric ether, or a dram of nitrous ether, with a dram of sal-volatile or a little brandy or whisky, in an ounce or two of peppermint water. The feet and hands, if cold, may be placed in hot water. Balfour complained that he had been disappointed in the action of nitro-glycerine, and preferred inhalations of nitrite of amyl; and when these fail—as they often will—he resorted unhesitatingly to chloroform inhalations, and he adduced a great weight of evidence in favour of his contention that "so far from being unsafe in cardiac disease, it is often of the greatest use in these cases."† Sulphuric ether is used also for the same purpose, but, as Balfour said, "it is not rapid enough. Chloroform acts more quickly, even more effectually, and is perfectly safe." He gave it poured on a sponge, in a smelling-bottle, and the patient was told to breathe it through his nose as deeply as possible. "In this

* *Trans. of Medical Society*, vol. xiv., p. 291.
† "Diseases of the Heart" (2nd edit.), p. 309.

way relief is obtained in a few seconds, and so soon as the narcotic influence is produced the smelling-bottle drops, and with it rolls away all risk of any overdose."

Professor Bradbury, of Cambridge, introduced *erythrol tetra-nitrate* as a vaso-dilator and a remedy for angina pectoris. Its use has also been commended by others who have employed it. It is less rapid in producing its effects than amyl-nitrite or nitro-glycerine, but its influence is much more lasting. The dose is $\frac{1}{2}$–1 grain in alcoholic solution or in tablets; and if a continuous effect is desired, the dose should be repeated every 4–6 hours.

Gibson * thinks highly of the inhalation of iodide of ethyl, otherwise known as hydriodic ether: 5-minim glass capsules afford an efficient dose. Its beneficial action he believes to be "due to the liberation of free iodine, which is rapidly absorbed by the blood."

If the attacks are nocturnal, a precautionary dose of nitro-glycerine or erythrol tetra-nitrate may be taken each night at bedtime. An objection to all the nitrites lies in their liability to excite headache.

Free access of air to the sufferer should be secured. If he can be induced to draw a few deep breaths, this will sometimes cut short a paroxysm. He should be placed in the most comfortable posture that circumstances permit; if he is in bed, hot bottles may be put to his feet.

In severe and protracted attacks we may be obliged to have recourse to hypodermic injections of morphine. A sixth or a quarter of a grain may be injected for a dose. Morphine seems to be better tolerated in cases of cardiac pain with a weak heart than when it is given to relieve other neuralgias in the same circumstances. When given to relieve cardiac pain there seems to be less risk of its causing cardiac depression. It is, however, a good plan to give some ether and ammonia mixture at the same time, to counteract any such possible depression, or a small dose of strychnine ($\frac{1}{40}$ to $\frac{1}{20}$ grain) may be combined with the

* "Diseases of the Heart and Aorta," p. 784.

hypodermic injection of morphine. Chloral may be tried cautiously, in addition to or in place of morphine. The ethereal tinctures of valerian and of castor have been found useful. The inhalation of *pyridine* has been said to give immediate relief, but the unpleasant penetrating odour of this substance makes patients object greatly to its use. Bromide of ethyl has also been used in inhalation, and so has alcoholised oxygen. We have already remarked on the value of counter-irritation in the form of flying blisters in those cases where a chronic aortitis may have involved contiguous branches of the cardiac plexus. A hot mustard poultice to the præcordial region may be useful at times. The application of the continuous electric current along the course of the vagus, in the neck, and down the arm, in cases where a distinctly painful aura is experienced in the hand, has been found useful in warding off attacks. Leeches applied over the sternal region and repeated small bleedings from the arm have been found useful in some cases.

ADDITIONAL FORMULÆ

Drops for palpitation

℞ Tincturæ digitalis, ʒij.
Tincturæ valerianæ, ʒij.
Ferri acetatis ætherii, ʒiij.
M. f. mist. Twenty-five drops in water three times a day.
(*Schnitzler.*)

For functional palpitation

℞ Spiritus ammoniæ aromatici, ʒj.
Ætheris sulphuris, ʒij.
Tincturæ zingiberis, ʒiij.
Essentiæ menthæ piperitæ, ʒiij.
Spiritus camphoræ, ʒiij.
Tincturæ cardamomi compositæ ad ʒiij.
M. f. mist. A small teaspoonful in a wineglass of water every fifteen minutes whilst the palpitation and difficulty of breathing are severe. (*Whitla.*)

Another

℞ Acidi hydrobromici diluti, ʒvj.
Tincturæ belladonnæ, ʒiij.
Tincturæ nucis vomicæ, ʒij.
Glycerini puri, ʒjss.
Tincturæ quininæ ad ʒvj.
M. f. mist. A dessertspoonful in two tablespoonfuls of water three times a day before meals. (*Whitla.*)

For the anginal attack

℞ Tincturæ digitalis
Tincturæ belladonnæ
Tincturæ valerianæ
Spiritus ætheris compositi } ää ʒj.
M. f. tinct. Ten to twenty drops during the attack.
(*Gallois.*)

For neurotic palpitations

℞ Tincturæ digitalis, ʒss.
Potassii bromidi, ʒv.
Aquæ ad ℥x.

M. f. mist. One to three tablespoonfuls daily.
(*Huchard.*)

For palpitations connected with masturbation

℞ Potassii bromidi, ʒvss.
Tincturæ digitalis, ʒijss.
Infusi cascarillæ, ℥iv.

M. f. mist. A dessertspoonful two or three times a day.
(*Da Costa.*)

Pills for nervous palpitation

℞ Pulveris digitalis, gr. lxxv.
Pulveris asafœtidæ, gr. lxxv.
Syrupi, quantum sufficiat

Ut f. pilulæ centum. One to four pills daily. (*Withering.*)

Hypodermic administration of nitro-glycerine

℞ Liquor trinitrini, ♏xxv.
Spt. rect. 90 per cent., ♏x.
Aquæ dest. ad ʒj.

M. Dose 1–4 minims.
(*Gibson.*)

For the anginal paroxysm

℞ Spiritus ammoniæ aromatici, ʒj.
Sodii bicarbonatis, gr. x.
Tincturæ cardamomi compositæ, ʒj.
Spiritus chloroformi, ♏xx.
Solutionis nitro-glycerini (1 per cent.), ♏j.
Aquæ ad ℥jss.

M. f. haust. To be slowly sipped on the commencement of symptoms. (*Powell.*)

For angina pectoris

℞ Sodii iodidi, gr. lxxx ad clx.
Sodii arsenatis, gr. ¾.
Aquæ destillatæ ad ℥v.

M. f. mist. Two or three teaspoonfuls daily. (*Huchard.*)

In anginal attacks

℞ Ethyli bromidi, ʒss.
Aquæ destillatæ, ℥xijss.

M. Two to four tablespoonfuls for a dose. (*Seguin.*)

For the intervals in angina pectoris

℞ Quininæ sulphatis, ʒss.
Acidi arseniosi, gr. ss.
Extracti valerianæ, q.s.

Ut f. pil. xxx. Two to four daily. (*Gallois.*)

CHAPTER XX

TREATMENT OF DISEASES OF THE ARTERIES: ARTERIO-SCLEROSIS (ATHEROMA, OR ENDARTERITIS DEFORMANS)—ANEURYSM

ARTERIO-SCLEROSIS: Atheroma — Nature and Causation—Heredity—Vascular Strain—Athletic Exercises—Toxæmic States—Dietetic Excesses and Errors—Effects of Heightened Blood-pressure—Necessity for *Treatment* in Early Stages—Potassium Iodide—Nitro-glycerine—Eliminative Measures—Mineral Waters—Exercise—Food—Hygiene—Insomnia.

INTERNAL ANEURYSM: Causation—Degenerative Changes—Sudden Strain—Syphilis—Symptoms Curability of Aneurysm influenced by its Form—*Indications for Treatment*—Blood-letting—Rest and Restricted Diet—The Tufnell Method—Objections to it—Modifications of it—Potassium Iodide—Calcium Salts—Gelatin Injections—Ice—Electrolysis—Introduction of Foreign Bodies into Sac—Distal Ligature—Proximal Pressure—Macewen's Method—Arteriorrhaphy—*Treatment of Symptoms*—Pain—Dyspnœa—Anginal Attacks. Additional Formulæ.

THE arteries are prone to undergo degenerative changes, fatty, calcareous, and hyaline; but that which chiefly concerns us here is the disease diffusely affecting the walls of arteries, known as **arterio-sclerosis**, the existence of which in the large vessels is one of the chief conditions on which the occurrence of **aneurysm** depends.

ARTERIO-SCLEROSIS

This affection of the arteries appears to be a true *arteritis*, the inflammation attacking chiefly the middle coat (*mesarteritis*), and involving also the adventitia (*periarteritis*); it is attended with infiltrative and hypertrophic changes, and weakening of the walls of the vessel occurs in consequence. The proliferative changes and thickening which at the same time occur

in the *intima* are regarded as compensatory, and in the early stage before these occur rapid dilatation at the weakened spot may take place, and thus an *aneurysm* be formed.

Atheroma is a superadded process of chronic inflammation and degeneration of the *intima*. The so-called "*atheromatous ulcer*" is formed by the breaking down of the degenerated tissue and rupture of the endothelium, with the production of a molecular débris.

Diffuse arterial changes of this kind are common. They occur in old people as a **senile** change, and are caused by the wear and tear to which the arterial tubes have been subjected over a long period of years. But such changes also occur prematurely in certain comparatively young persons, when their arterial tissues are especially vulnerable, so that chronic arteritis readily arises from relatively slight irritation. This vulnerability would seem, in some cases, to be inherited. "Entire families sometimes show this tendency to early arterio-sclerosis—a tendency which cannot be explained in any other way than that in the make-up of the machine bad material was used for the tubing."*

Strain of the arterial walls from excessive internal blood-pressure is the chief factor in the direct production of these changes. Such physical strain is necessarily most frequent in the class who live hard lives of manual labour. Another cause is the practice of athletic exercises by persons not well adapted by their original conformation to such efforts. Severe athletic exercises, even in the muscularly strong and robust, if pushed beyond a certain degree, tend to be followed by the morbid results of arterial strain; how much more so must this be the case when such exercises are undertaken by persons of feeble organisation, whose nervous energy and emulation prompt them to these unequal contests.

These arterial changes are also induced by constitutional blood conditions, acting either as direct

* Osler, "Practice of Medicine" (8th edit.), p. 842.

irritants to the arterial tissues, or indirectly by causing heightened blood-pressure. Alcohol, gout, rheumatism, lead, syphilis (this last probably excites a *specific* arteritis), may any of them cause endarteritis. The poisons of certain fevers, especially malarial fevers, have the same effect on certain constitutions.

Over-filling of the blood-vessels and intoxication of the blood from excess of food and drink, when combined with indolence or with constipation, may also become a cause of this condition. All the evidence we have points to the baneful influence of tobacco on the heart and blood-vessels, when the golden mean has been habitually exceeded, and particularly in boyhood.

Diffused arterio-sclerosis (*arterio-capillary fibrosis*) is often found associated with renal changes, cardiac hypertrophy, and "fibrous myocarditis." In some cases the renal changes may be primary and the arterial secondary; but in many others the arterial sclerosis appears to precede the renal affection.

In the pulmonary artery and its branches sclerosing changes are found as a consequence of continued increased tension in the pulmonary vessels, caused by mitral obstruction and emphysema. Similar changes have been found in the venous system (*phlebo-sclerosis*) after exposure to heightened blood-pressure.

Considering the serious nature of the many morbid changes (apart from large aneurysms, which will be considered separately) to which arterial degeneration gives rise, the **treatment** of the earlier stages of this affection has scarcely received adequate attention. When we encounter, on examining a patient who may be thought to be sound in health (a candidate for life assurance, for instance), or who may complain of some trifling derangement, a pulse of high tension, arteries more or less palpably thickened, elongated, and tortuous (we should examine the brachials for this purpose as well as the radials), some evidence of ventricular hypertrophy, and an accentuated aortic second sound, we should estimate adequately the

danger to which such a person is exposed. Should the coronary arteries become involved there is the probability of attacks of angina pectoris, and the certainty of cardiac degeneration. Should the cerebral arteries be especially affected, we may encounter symptoms of cerebral degeneration, or of cerebral hæmorrhage from rupture of miliary aneurysms. Degenerative pulmonary emphysema and asthma are not uncommon accompaniments of this disease. Renal degeneration and wasted kidneys may be a consequence, as well as a cause, of arterio-sclerosis. Are we helpless to prevent the development of these serious morbid states? By no means. If such patients will be content to follow a rational and a strict régime, hygienic, dietetic, and medicinal, not only may these risks be kept in abeyance, but a distinct improvement in the condition of the arterial system may be brought about. In the first place, it is necessary to seek out evidences of any constitutional vice that may need rectifying. Syphilis ought never to be overlooked; it is a great advantage that small doses of potassium or sodium iodide long continued are as useful in the gouty and rheumatic as in the syphilitic forms, and many Continental physicians maintain that this drug is a true tonic to the heart. We do not share this view, but we believe that the improved cardiac action which is observed to follow its use depends rather on its remarkable eliminative effects, diminishing arterial tension. Perhaps also it exerts some directly favourable influence on the intima of the blood-vessels. It seems, too, to diminish the viscosity of the blood, and so, by lessening peripheral resistance, promotes its onward movement. We should give it in 3- to 5-grain doses three times a day, combined with 5 to 10 grains of potassium bicarbonate, 20 minims of aromatic spirits of ammonia, and an ounce of a bitter infusion, such as calumba, gentian, or serpentary; we should continue its use, with occasional interruptions of ten or twelve days, for three or four months at a time. If needed the

iodide action may be reinforced by the simultaneous administration of tablets of nitro-glycerine at intervals during the day to promote vascular relaxation. The bowels should be always kept freely relieved by some suitable aperient; a mercurial laxative, followed by a saline draught in the morning, may be given once or twice a week, and if dyspeptic symptoms and constipation are prominent conditions, occasional courses of mineral waters will prove of much value. But their use must be wisely directed, as any overfilling of the vessels must be guarded against, and it must be seen that the water ingested passes freely away by the kidneys or bowels, or by both.

For the corpulent the waters of Marienbad, Carlsbad, Kissingen, Tarasp, or Brides, or others of this class, are more suitable; for the thin and ill-nourished dyspeptic, Vichy, Royat, Neuenahr, Baden-Baden, and also Kissingen, may be recommended. Tepid baths of short duration, combined with friction of the skin, are of value for promoting cutaneous excretion, but long-continued hot baths or Turkish baths must be avoided. Regular moderate exercise in good air, shooting, fishing, easy riding, or golf, always stopping short of fatigue, are to be encouraged, but all violent or strenuous muscular exertion and all participation in athletic contests should be strictly prohibited.

Metchnikoff advanced the view that arterial degeneration was due to the absorption from the intestine of the products of activity of the *Bacillus coli:* he sought to counteract this by modifying the intestinal flora, replacing the *Bacillus coli* by the *Bacillus bulgaricus* by means of the consumption of soured milk. It cannot be said that we have as yet any evidence of the efficacy of the treatment founded on this hypothesis.

In cases with threatenings of cardiac failure, from post-hypertrophic degeneration, as indicated by irregular and intermittent heart-beat, attacks of dyspnœa on slight exertion or from flatulent distension of the stomach, and occasional attacks of giddi-

ness, we must pursue the lines of treatment suitable for cardiac failure. In former years such symptoms were appropriately met by blood-letting.

The food should be limited to the actual wants of the system. The meals should be small, and taken at adequate intervals; they should be eaten slowly, and no fluid should be taken with the meal, but afterwards. Fresh vegetables may be eaten freely, but animal food and eggs only sparingly. The ideal diet is one in which vegetables and milk take the first place, while albuminous foods, on account of the liability to intestinal decomposition, with production and absorption of toxins, should be reduced to the lowest amount compatible with health. Meat extracts, rich gravies, and rich dishes of animal food should be entirely forbidden. In the case of the obese, the necessity of limiting carbohydrates compels a rather freer use of lean meat, poultry, fish, or eggs, along with green vegetables, salads, and fruit. The same precaution will be necessary in the not-infrequent cases of arterio-sclerosis associated with glycosuria: here, however, the need for albuminous food is less than in obesity, as the carbohydrate withdrawn may be largely replaced by fat. Habits of diet of lifelong standing cannot be uprooted in a day. Root-and-branch changes are intolerable to some, and with these we must be content if we can now and again interpolate periods of stricter regimen into their usual course of living. Alcohol and tobacco should be abstained from, or, if complete deprivation is intolerable, should be strictly limited in amount. Strong tea and coffee must also be proscribed. A temporary milk diet proves very useful in some cases, especially when it promotes free diuresis.

Sexual excitement in advanced cases is certainly undesirable; and emotional disturbances should, as far as possible, be guarded against. The body should be warmly clad, and exposure to extremes of heat and cold avoided; a bright, genial, sunny climate in winter is a great advantage.

The subjects of hypertension and of arteriosclerosis are apt to suffer from disturbed sleep. A combination of the bromide and iodide of sodium may be given, and it may be necessary at times to have recourse to an occasional dose of chloral as well.

We now pass on to the consideration of the most serious manifestation of arterial disease—

Aneurysm

The medical aspects of aneurysm are confined almost exclusively to aneurysms affecting the aorta and the large arterial branches that spring from it within the thorax and abdomen, i.e. to "internal aneurysms." Aneurysms of the arteries of the limbs, often traumatic in their origin, fall under the care of the surgeon, and are especially amenable to surgical treatment—compression, ligature, etc.

Aneurysms usually arise from a weakening of some part of the wall of an artery, e.g. the aorta, by chronic inflammation and degenerative changes such as we have already described; the wall of the artery is predisposed to yield in consequence of these changes, but some sudden strain, accidental or otherwise, is often the immediate cause of an aneurysmal dilatation. Mechanical violence, or any strain put upon the arteries, suddenly or repeatedly, may lead to the production of an aneurysm of the aorta when its walls are weakened by chronic disease. **Syphilis,** as the cause of a probably specific form of arteritis, is frequently concerned in the etiology of aneurysm.

The **symptoms** of aortic aneurysm are chiefly those dependent on pressure of the tumour on adjacent parts or organs, and they vary, therefore, according to its situation and mode of growth in relation to surrounding structures. The dangers attending it are partly dependent on those pressure symptoms and partly on its tendency to rupture. An aneurysm, for instance, affecting the arch of the aorta, situated as it is in the vicinity of most important structures, may, it is clear, in its develop-

ment and growth give rise to the most serious and distressing symptoms from compressing adjacent structures, and these have to be considered in the treatment of the case, as they frequently lead to a fatal issue independently of any rupture of the sac.

The form of the aneurysmal dilatation will greatly influence the probability of cure by suitable treatment. A *cylindrical* or *fusiform* aneurysm, affecting, that is, the whole circumference of the aorta, is not amenable to curative measures, and a *sacculated* aneurysm will be more or less so according as its communication with the artery is by a small or a large opening.

Internal aneurysms are sometimes cured by the deposition of layers of coagulated fibrin within the sac, their organisation and the subsequent obliteration of the sac by contraction or inflammation. The **indications for treatment,** therefore, are to lessen the force and frequency of the heart-beat, and so slow the current of blood in the aneurysmal sac; to lessen arterial tension; to increase the coagulability of the blood in the sac. By these means we may hope to promote obliteration and contraction of the sac, when the anatomical conditions are favourable.

Various methods have, from time to time, been suggested and practised for the purpose of giving effect to these indications: many of them have completely failed, and are no longer employed.

The repeated abstraction of blood with the view of reducing blood-pressure, slowing the current of blood in the sac and so favouring coagulation, was advocated by Valsalva and practised by Dr. Hope* to the extent of withdrawing 12 ounces of blood daily for sixteen consecutive days. This method was combined with a strictly limited diet and prolonged and absolute repose. But instead of quieting the heart-beat it often caused cardiac excitement and irritability; and too great restriction in diet lessens and does not increase the coagulability of the blood.

*Dujardin-Beaumetz, "Clinique Thérapeutique" (5th edit.), vol. i., p. 195.

Another method, somewhat analogous to the preceding, without the bleedings, has had many advocates. It consists in a severe restriction of the diet, both in solids and liquids, together with absolute rest in the recumbent position for a protracted period. It has been termed the "**rest-and-starvation**" method. Its objects are to reduce the quantity and fluidity of the blood and so increase its coagulability, to lessen intra-arterial tension, and to reduce greatly the frequency of the heart-beat.

Tufnell, who adopted this method with some success, pointed out that for this treatment to be successful three conditions were essential: first, the aneurysm must spring from the front of the vessel; second, the sac must be perfect; and third, there must be a fibrinating power in the blood. He limited the quantity of fluid taken to 8 ounces in the day—2 ounces of milk or cocoa at breakfast, 4 ounces of water or light claret at dinner, and 2 ounces of milk or cocoa at tea or supper. There is, however, in practice, great difficulty in keeping the fluids down to this limit, and some patients find the thirst attending the attempt intolerable. The solids were limited likewise to 10 ounces daily—2 ounces of bread and butter at breakfast, 3 ounces of cooked meat and 3 ounces of bread or potatoes at dinner, and 2 ounces of bread and butter at tea or supper.

This treatment by enforced rest in the recumbent position and the above diet was to be maintained for three months or longer. Great difficulties occur in carrying out this method. Certain temperaments bear the enforced rest badly: they become introspective and fretful, and the heart's action becomes hurried and irritable instead of being quieted. Others become weak and anæmic, and the injury to the general nutrition they suffer seems to aggravate their condition and to promote the further advance of degenerative changes. In such instances this method should be abandoned or greatly modified. In fairly strong and vigorous patients of calm and

placid temperament, successful results may, no doubt, occasionally be obtained from the treatment. In applying this system it is important to see that the patient's bed is comfortable, that the surroundings are cheerful, and that he is spared all worry and excitement. The tendency to constipation which necessarily attends this method must be overcome by suitable aperients or enemata, as straining at stool must not be permitted; and sexual intercourse must, in all cases, be strictly forbidden.

A modification of this method, in which the patient is kept as much at rest as is consistent with his comfort and general health, the consumption of liquids is restricted to the quantity absolutely necessary, and a somewhat greater quantity and variety of food are permitted, will be found to be attended with as great or even greater benefit in the majority of cases.

One of the most generally accepted methods of treatment of aortic aneurysm, and that from which we have ourselves obtained the best results, is the administration of full doses of **potassium iodide,** together with a careful mode of living, especially as to diet and exercise. The dose should be from 10 to 20 or 25 grains three times a day. Some difference of opinion exists as to the dose that should be given. Some consider 15 grains three times a day the limit, others think better results are obtained from larger doses; 15 grains three times a day we have found sufficient in many cases, but in others we have not obtained the best results until we have increased the dose to 30 and even 40 grains thrice daily.

Amendment is often observed speedily to follow the institution of this treatment; pain is relieved, the force of the pulsation in the aneurysm is distinctly lessened, and the area of dullness diminished, and in some cases complete consolidation of the sac seems to be induced. It is somewhat difficult to explain the mode of action of this remedy. Balfour thought it exerted a special influence on the wall of the sac,

causing thickening and contraction. It certainly lowers blood-pressure, and so favours contraction of the sac by relieving tension within it.

One great advantage of this treatment is that it does not necessarily demand a cessation of all occupation; and one of our own patients, an enthusiastic and restless musician, conducted a large orchestra for many years with a large aortic aneurysm, while taking 40 grains of potassium iodide thrice daily.

In determining the dose most suitable to each case, one should be guided by the pulse-rate; if the larger doses increase the pulse-rate, we should return to the smaller ones.

The sodium iodide has been recommended by Huchard as less depressing and better tolerated than the potassium iodide, and it may be employed when any difficulty is experienced in taking the latter.

Calcium chloride, which has the property of increasing the coagulability of the blood, has also been given for the cure of aneurysm, and good results have been reported, but we doubt if any reliance can be placed on it as a remedy.

More recently Lancereaux has advocated the subcutaneous injection of solution of gelatin in the treatment of aneurysm, in the belief that the gelatin is absorbed and increases the coagulability of the blood. Careful sterilisation of the gelatin solution is of the utmost importance, as it is liable to harbour tetanus spores and other infective micro-organisms. Tetanus spores may be killed by boiling the solution for three minutes without affecting the process of gelatinisation. This method may be carried out by the subcutaneous injection (the best situation is in the lax tissues of the thigh or flank) of 6 ounces of a 1 per cent. solution of gelatin in normal salt solution at a temperature of 100° F. The strength of the solution may be gradually increased up to 2 per cent. Some have carried it even to 5 per cent., but at the expense of increased pain and

increased risk. To avoid exciting local pain, each injection should occupy from ten to twenty minutes.*

The value of this method has been very variously estimated. Good results have been published in France, Italy, and Germany, and failures have also been numerous. In this country very few successful results have been obtained. There seems to be little doubt that its application has, in certain instances, been followed by some relief of the subjective symptoms, together with a diminution in size and pulsation of the sac. But very serious and even fatal symptoms have followed its employment in a number of instances, and much pain is caused locally by the injections. With a view to avoiding this, gelatin solution has been given by the mouth, and also in small enemata into the bowel. These latter modes of administration are at any rate free from pain and danger. However administered, it cannot be said that the curative results afford any high degree of encouragement for its use.

Fränkel has called attention to the great value in syphilitic cases of mercurial inunctions, with a milk diet, rest in bed, and the local application of the ice-bag.

The application of **ice** or of refrigerating mixtures to the aneurysmal tumour, when it projects on the surface, has been advocated not only for the purpose of allaying pain, but with the idea that it may possibly promote coagulation; and, no doubt, if applied over the region of the heart, it tends to moderate its action. But, as has been pointed out by Dujardin-Beaumetz, cold retards and does not promote coagulation, and he is disposed to refer whatever beneficial results have been found to follow these applications either to a contraction of the sac, or rather to inflammation in it caused by the prolonged application of cold. He also calls attention to certain dangers attending these applications, such as diminished vitality of the skin, when external

* A convenient apparatus for this purpose is supplied by Messrs. Squire & Sons, Oxford Street, W.

rupture is imminent, and pulmonary congestion and bronchitis from chill. We have ourselves very thoroughly tried the protracted local application of ice to thoracic aneurysms projecting from the chest wall, but, beyond a temporary reduction of the frequency of the heart-beat, we have not been able to observe any curative effect.

The known coagulating power of the **electric current** on albumin has led to its application in the treatment of aneurysmal tumours, with the object of producing coagulation within the sac. Much was hoped from it, but it cannot be said that these expectations have been justified.

That method is, however, still occasionally applied, especially to aortic aneurysms in which the sac projects considerably on the surface. Two, three, or more needles, according to the extent of the sac, should be introduced, and they should be directed rather towards the periphery of the sac than towards the aorta, as it is of great importance to avoid the formation of a coagulum near the general blood current. The needles must be covered at their upper part with a protective non-conducting coating, to avoid the corrosive action of the electric current on the tissue pierced by them. The needles may, in the case of a large sac, be introduced into different parts of the sac at different sittings. It seems best to connect the needles with the *positive* pole only, as the clot formed is firmer than with the negative pole, and to apply the latter connected with a larger copper electrode to the adjacent surface.

The sittings should last for ten to fifteen minutes, and the strength of the current should not exceed 10 to 20 milliampères. In some successful cases there have been as many as thirteen sittings at intervals of three to six days.

In this, as in all other methods of treatment, the more completely sacculated the aneurysm is, and the narrower is its orifice of communication with the aorta, the better are the results likely to be.

The introduction of foreign bodies into the sac of the aneurysm, with the view of promoting coagulation in it, such as considerable lengths of watch-spring, of iron or silver wire (with or without electricity), of horse-hair, etc., need not detain us, as the effect of these methods of treatment has been, in most cases of aortic aneurysm, disastrous.

The method of **distal ligature,** that is, the application of a ligature to the vessel (or its branches) beyond the aneurysm, and not between it and the heart, has been suggested and applied in cases of aneurysm of the aorta and the innominate. Ligature of the left carotid has been undertaken for aneurysm of the aortic arch, and ligature of both the right subclavian and carotid for aneurysm of the innominate or of the first part of the aorta. When cure of the aneurysm follows this operation, it has been suggested that it is through the formation of a clot on the proximal side of the ligature, and the extension of this down the artery into the sac. It is only applicable to a very limited number of cases, and should not be resorted to in any case until less serious methods have been tried and have failed to arrest the progress of the aneurysmal tumour; twenty-three out of thirty-five cases in which this operation was performed "died outright, or were hastened to a fatal termination by the operation." * A cure is said to have resulted in six of these cases, but *temporary arrest* would seem to be the fitter term to apply, as a survival of four and a half and three and a half years is scarcely the same thing as a cure.

This method is unsuitable in cases in which there is general atheroma or valvular cardiac disease, or any visceral complication. It has most promise in distinctly sacculated cases arising suddenly from over-exertion or injury.

The method of **proximal pressure,** i.e. pressure applied to the aorta between the heart and the aneurysm, has been used successfully in a certain number

* Pepper's "System of Practical Medicine," vol. iii., p. 819.

of cases of aneurysm of the abdominal aorta ; the object of the operation being to retard or obstruct the blood current sufficiently to allow of coagulation within the sac, and so cause its obliteration.

The cases in which this method has been successful have been those of healthy young men in whom, it may be assumed, the rest of the vascular system was free from disease, and in whom the local disease probably originated in injury or over-exertion. The method of operating is as follows : the patient being anæsthetised, a Lister's tourniquet is carefully adjusted in position over the abdominal aorta and above the tumour, and slowly screwed down, care being taken to avoid, as much as possible, injury to the intestines. The aorta is compressed until all pulsation in the aneurysm and in both femorals is arrested. The lower limbs are at the same time enveloped in cotton-wool and flannel, and kept warm by hot-water bottles. In Mr. Durham's successful case the compression was maintained for ten hours and a half. Greenhow had a successful case in which the abdominal aorta was compressed first for three-quarters of an hour, again for four hours, and again, after some days' interval, for eight hours.

This method is quite unsuited to cases associated with general arterial degeneration, for by shutting off the blood from the lower half of the body the tension in the arteries of the upper half becomes extreme. It is a method obviously attended with grave risks, and in a considerable proportion of the cases in which it has been applied death has resulted directly from the effect of the operation ; it would seem to be suitable only to those cases in which, the rest of the arterial system being healthy, the tumour is rapidly enlarging, and milder means have failed to arrest its growth.

Macewen has described a method of producing what he terms "white thrombi" within the aneurysmal sac by the process of inflammation excited in the wall of the sac by irritation with the point of

a pin passed into the sac with strict antiseptic precautions, and carried across it until it reaches the opposite wall, where it is left for some hours, so that the movement imparted to it by the blood current may cause it to scratch the surface of the sac and excite the necessary amount of irritation. Different parts of the sac may be acted upon by the same needle without its withdrawal. He believes that this illustrates an important principle in attempts to procure consolidation of an aneurysmal sac. The cases he cites in support of his views, although but few in number, appear to merit further consideration, and the method he describes has this to recommend it —that it is easy to carry out, and involves none of the serious risk which attends most other surgical modes of treatment.

Matas has devised an operation, known as *arteriorrhaphy:* this consists in obliterating by suture either the mouth of the aneurysm or the whole of the aneurysmal sac. It has found little favour with surgeons in this country.

In the course of aortic aneurysm many very painful symptoms arise, calling urgently for relief and palliation. The relief of pain may require the hypodermic use of morphine and atropine, and the local application of opium or belladonna liniments or plasters. Phenacetin, antipyrin, and aspirin have all been found very useful in these cases. When pain is due to pressure on nerves we may be able to afford some relief by change of posture. Inhalations of chloroform may be needed when pressure on the air-passages causes distressing dyspnœa. We have found small bleedings of value in relieving venous distension and some forms of painful dyspnœa. Tracheotomy or intubation may occasionally be needed, but this operation is only calculated to be of use when the urgent dyspnœa is laryngeal and due to bilateral abductor paralysis; most commonly the dyspnœa is due to pressure on the trachea near its bifurcation, and can only be relieved by anæs-

thetics. Anginal attacks may be relieved by nitroglycerine, and barium chloride has also been found useful for the same purpose in doses of $\frac{1}{10}$ grain thrice daily. Great comfort has been derived, in certain situations of the external tumour, from a well-applied elastic support.

As the end draws near we can relieve suffering by the free administration of morphine. Most physicians will have had the sad experience of watching an ulcerated external aneurysm leaking for days, and even weeks, and have asked themselves whether they are not justified in putting an end to such anguish, mental and physical. To this question the answer must be an uncompromising negative.

ADDITIONAL FORMULÆ

Pills for arterio-sclerosis with feeble heart

℞ Sodii iodidi, ʒj.
Sparteinæ sulphatis, gr. xv.
Pulveris glycyrrhizæ, q.s.
Ut f. pil. xl. Four to six daily. (To be kept in a dry place.) (*Huchard.*)

Powder for arterial hypertension

℞ Potassii nitratis, gr. xx.
Sodii nitritis, gr. j vel ij.
M. f. pulv. j. Take one dissolved in water daily. (*Lauder Brunton.*)

To relieve the pain and restlessness of aneurysmal pressure

℞ Morphinæ hydrochloridi, gr. $\frac{1}{4}$ ad $\frac{1}{3}$.
Spiritus ætheris compositi, ʒss.
Aquæ menthæ piperitæ ad ℥j.
M. f. haust. To be taken occasionally.

For aneurysm

℞ Potassii iodidi, ʒiij.
Infusi chiratæ, ℥vj.
M. f. mist. A tablespoonful three times a day. (*Balfour.*)

For the cough of aneurysm

℞ Morphinæ hydrochloridi, gr. j.
Acidi hydrochlorici diluti, ♏v.
Acidi hydrocyanici diluti, ʒss.
Syrupi scillæ, ℥j.
Aquæ, ℥j.
M. f. mist. A teaspoonful occasionally. (*Balfour.*)

Or

℞ Syrupi scillæ, ʒij.
Spiritus lavandulæ compositi, ʒiv.
Tincturæ opii ammoniatæ, ʒiv.
Syrupi simplicis, ℥j.
Aquæ menthæ piperitæ, ℥ij.
M. f. mist. A tablespoonful every three hours, and 15 minims of chlorodyne in addition when required. (*Balfour.*)

Combination of iodide and bromide in aneurysm

℞ Potassii iodidi, ʒij.
Sodii bromidi, ʒij.
Syrupi floris aurantii, ʒiv.
Aquæ ad ℥vj.

M. f. mist. A tablespoonful three times a day. (*Jaccoud.*)

To relieve aneurysmal neuralgia

℞ Extracti belladonnæ, ʒij.
Extracti opii, ʒj.
Spiritus vini rectificati, ʒss.
Glycerini, ℥ss.

M. f. lin. To be applied externally to the painful part.

CHAPTER XXI

TREATMENT OF ANÆMIAS

ANÆMIA: Definition—Some Physical Characters of Healthy Blood and of Red Blood-corpuscles.
SECONDARY OR SYMPTOMATIC ANÆMIA: *Chlorosis*—Causation—Symptoms—*Treatment*—(1) Dietetic, (2) Hygienic, (3) Medicinal—Aperients—Iron, its various Preparations and Modes of Administration—Natural Chalybeate Waters and Baths—Arsenical Waters—Chloride of Gold—Manganese—Arsenic—Calcium—Intestinal Antiseptics.
ACUTE SECONDARY ANÆMIA: *Treatment*—Combat Collapse—Pituitrin—Inhalations of Oxygen.
PERNICIOUS ANÆMIA: Characters—Blood Changes—*Treatment*—Rest—Diet—Arsenic in Large Doses—Cacodylate of Soda—Salvarsan—Bone-marrow—Antiseptics—Serum Treatment.
Additional Formulæ.

By **anæmia** is meant either a reduction in the whole volume of blood, or a reduction in the number of red corpuscles, or a reduction in its most important constituent, the *hæmoglobin* or colouring matter of the corpuscles. It is chiefly a "poverty of the blood in normal functional red corpuscles."

A few facts with regard to the physical characters of the blood and the life-history of the red corpuscles had better be stated before we approach the subject of the treatment of the several forms of anæmia.

The specific gravity of healthy blood varies between about 1040 and 1070, that of the plasma alone, without the corpuscles, between 1026 and 1029. It has a distinctly alkaline reaction. The average size of the red corpuscle is 7·5 μ (micro-millimetres) in diameter, and the range in health varies between 6·5 and 9 μ. In embryonic and infantile life the range is greater, viz. from 2·5 to 14 μ. The smaller have been termed *microcytes*, the larger *megalocytes*.

The red corpuscles consist of a stroma, com-

posed of globulin, coloured with a red pigment, the **hæmoglobin.** This is only loosely combined with the stroma, and can be split up into an albuminate and a red pigment which is termed *hæmatin.* The depth of colour of the red corpuscles, and their functional activity, depend on the amount of hæmoglobin they contain. This is expressed as the "*colour index*"—a number giving the average amount of hæmoglobin in each corpuscle, as compared with the normal. It is obtained by dividing the amount of hæmoglobin by the number of corpuscles, each being expressed as a percentage of the normal.

The average number of red corpuscles in healthy blood is 5,000,000 to 5,500,000 per cubic millimetre in the male, and 4,500,000 to 5,000,000 in the female; in estimating the colour index 5,000,000 is taken as the normal for each sex.

Nucleated red corpuscles are found, normally, only in the embryo, and it is generally admitted that a nucleated red blood-corpuscle is the immediate antecedent of the fully developed non-nucleated one. The red corpuscles are now believed to originate exclusively in the red bone-marrow, which occurs in health in the cancellous portion of the flat bones and the extremities of the long bones. It consists essentially of a plexus of thin and incompletely walled blood-vessels, between which there are the mother-cells of the red corpuscles and leucocytes. The mother-cell of the red corpuscle is called a *normoblast.* It is exactly like a normal red corpuscle, except that it has a large central deeply-staining nucleus: this probably undergoes solution within the cell in the process of transformation. In conditions of very rapid blood regeneration normoblasts occur in the circulating blood, and are of good omen as indicating great functional activity of the red bone-marrow. It is believed by some that in the case of exceptional demands on the blood-forming functions there may be some formation of red corpuscles in the spleen or lymphatic glands.

The average life of a red blood-corpuscle has been estimated at fourteen days. The precise manner in which it undergoes disintegration is not known. Its destruction would, however, appear to take place chiefly in the portal vessels, and the spleen and gastro-intestinal mucous membrane seem to be the most active seats of blood destruction. The liberated hæmoglobin is carried to the liver, and there converted into pigment.

In anæmia the number of red blood-corpuscles, and the amount of hæmoglobin contained in them, may vary very greatly: the red corpuscles may be reduced to between 80 and 20 per cent., and the gravity of the case will depend on the amount of the loss. Hayem has reported a case, following puerperal hæmorrhage, in which the number of red blood-corpuscles fell as low as 850,000, or only 17 per cent., and in which the patient recovered.

It has been customary to classify anæmias into (*a*) *symptomatic* or *secondary*, i.e. those cases in which the anæmia is rather a symptom than a disease, owing its existence to the presence of other morbid states, and (*b*) *primary* or "*idiopathic*" anæmias, including in this class *chlorosis*. But this classification is, in the present state of our knowledge, of doubtful accuracy, and for therapeutic purposes we may consider the treatment of the ordinary forms of symptomatic anæmia together with that of chlorosis.

In **secondary anæmias** the hæmoglobin is usually diminished more than the red corpuscles, the body of the corpuscle being reproduced more quickly than its colouring matter, so that the colour index is slightly lowered—about 0·9. The red corpuscles are mostly normal in appearance, though a few normoblasts may be found, and are a favourable sign. Large numbers constitute a "blood-crisis," which is usually followed by very rapid improvement. The leucocytes are slightly increased in most cases.

Any disease or injury which leads to hæmorrhage must reduce the quantity of the blood and so cause

anæmia; so also any disease which interferes directly or indirectly with the process of blood formation, or produces abnormally active blood destruction, must also be attended or followed by anæmia. In hæmorrhagic cases the loss may be rapid and sudden, or gradual and continuous. Successive hæmorrhages, at intervals, are found to be more dangerous than a single hæmorrhage exceeding them in amount, as they interfere more with the regenerating processes. In some cases of large hæmorrhage the regeneration of the blood is very rapid—a week or ten days being adequate to reproduce the normal amount. The corpuscular elements are, however, restored much more slowly than the watery, saline, and albuminous constituents, as these are readily absorbed from the gastro-intestinal tract. The hæmoglobin also is restored more slowly than the corpuscles. Besides the direct loss of blood from hæmorrhage, other morbid states may cause anæmia, such as chronic suppuration, albuminuria, hyperlactation, rapidly-growing neoplasms, cancer, etc.

Or the defect may lie in the direct or indirect supply of blood-making material to the organism—as inanition from insufficient or unsuitable food supply; or from assimilative difficulties, as imperfect mastication, œsophageal obstruction, gastric cancer, or chronic dyspeptic states.

Or the functions of the assimilative and blood-making organs may be disturbed by acute febrile or chronic wasting diseases, and anæmic states follow the former and accompany the latter; but in such instances the treatment of the anæmia is but a part of the general management of these diseases. Or, again, conditions of toxæmia may bring about excessive destruction of the elements of the blood.

The **symptoms** that may be observed in cases of severe symptomatic anæmia are pallor of the countenance, and especially of the visible mucous membranes; loss of pink colour of the nails; digestive disturbances, such as loss of appetite, vomiting, gas-

tralgia, constipation ; palpitation and breathlessness on exertion, often with increase of cardiac dullness, owing to dilatation ; the presence of murmurs over the heart and large vessels. The dyspnœa is due in part to cardiac feebleness and in part to the deficiency of oxygen-carriers in the blood ; some œdema of the feet and ankles often occurs at night and disappears after rest in bed ; the nervous system generally presents some signs of irritability, and hysterical manifestations are not uncommon, together with a tendency to neuralgic attacks ; in acute anæmia from large hæmorrhages delirium and convulsions may precede fatal coma. Slight pyrexial states may occasionally occur, but they are far more common in the other forms.

Chlorosis is the term applied to a clinical form of anæmia usually regarded as less directly traceable to any antecedent disease than the secondary form, and although it has many features in common with the cases we have just been describing, it has other well-marked characters which we will briefly describe. Perhaps some of its special features are due to the fact that it occurs at an age when blood plasma is relatively more, and hæmoglobin relatively less, than at any other period of life.

Chlorosis is a disease of young girls, especially between 14 and 17 years of age. Its causation is doubtful, but it seems often to be associated with sexual disturbances, such as the onset of puberty, amenorrhœa, dysmenorrhœa, leucorrhœa, and with hysterical states, but these may be sequences and not antecedents of the disease. Lack of exercise and fresh air, emotional disturbances, the absorption of leucomaines and ptomaines from the large intestine as a consequence of habitual constipation, have all been suggested as possible causes.

Stockman* maintains that it "does not arise from excessive destruction of red corpuscles, but is due to deficient formation or to actual loss of blood,"

* Hare's "System of Practical Therapeutics," vol. i., p. 677.

and that "exact researches have demonstrated the absence of any special sepsis in the alimentary canal." His conclusion is "that the *direct* causes of chlorosis may be reduced to *two*, viz. insufficient supply of iron in the food and loss of iron from the body by menstrual or other bleeding." The onset of puberty and the consequent strain of rapid growth and development are important determining influences.

Hereditary influence has also been invoked. Virchow has even attributed chlorosis to a developmental defect in the circulatory system, but that is inconsistent with the transitory and curable nature of the malady.

The general symptoms resemble those we have described as common to moderately severe forms of secondary anæmia; the complexion is, however, of a yellowish-green colour, and not merely pale, as in anæmia; the skin occasionally shows areas of pigmentation, especially about the joints; the eyes are peculiarly brilliant, and the sclerotics sky-blue. We have already spoken of the breathlessness, palpitations, faintings, cardiac and vascular murmurs, neuralgias, digestive feebleness, constipation, œdema of the feet, which are common to this and to secondary anæmia. In chlorosis, especially, the subcutaneous fat is well maintained, and the patients appear plump.

But it is in the characters of the blood that the chief differences are found between this and the other form of anæmia. In chlorosis the red corpuscles may be scarcely at all reduced in number, but they are very poor in hæmoglobin. It is the hæmoglobin which is deficient in this disease, and it may be reduced to from 60 to 30 per cent. of the normal, i.e. the colour index is lowered, usually to 0·5 or under.

In the more severe cases the red corpuscles are also diminished, but the hæmoglobin is always disproportionately reduced. Cases have been observed in which the globular richness was over 85 per cent., and the hæmoglobin only 35 per cent.

Another character of the blood in chlorosis is the

frequent great inequality in the size of the corpuscles: many are much smaller than normal, 3 to 6 μ, and a few are larger. Leucocytes are normal, or decreased in number.

The **treatment** of chlorosis and the anæmic state will be best considered from three points of view: (1) dietetic, (2) hygienic, and (3) medicinal.

1. **Diet.**—Defective or unsuitable food is one of the most frequent causes of anæmia. With a diet composed exclusively of non-nitrogenous food it has been proved that the percentage of hæmoglobin in the blood undergoes a notable diminution, while it is augmented by a diet rich in albuminates. Defects in this respect will often be found in the dietaries of girls' schools, where anæmic conditions frequently become developed. Growth and development, so exceedingly rapid in girls as the period of puberty approaches, can only take place by the agency and at the expense of the nutrient fluids and their active elements, especially the red corpuscles, and these require a frequent and abundant supply of nutritious food for their constant regeneration. In hæmorrhagic cases recovery is often very rapid with suitable food, and the loss of blood, especially its fluid part, is soon repaired. But not only must we see that there is an adequate and suitable supply of food, we must also look to its digestion and assimilation. The digestive secretions in these cases are apt to be defective, both in quantity and quality. It has also been noticed that in anæmic persons the conditions of normal metabolism are somewhat modified, and especially that there is increased metabolism of the albuminates with an increased secretion of urea; but the metabolism of fat appears to be diminished, and while their muscles are feeble and wasted, they have a plump appearance from the presence of an abundance of adipose tissue; this has been referred to defective oxygenation, due to decrease in the red corpuscles, and consequent imperfect combustion of the fats and carbohydrates.

The food should at first be in small or moderate quantity, so as not to overtax the feeble digestive powers, and it should be in a readily digestible form. Milk, when easily digested, and cream, and all forms of animal food, presented in a form easy of digestion, are useful. Raw or slightly cooked meat, reduced to pulp, and mixed with a little pleasantly-flavoured consommé or broth, is of value as a blood restorer, because of its high percentage of iron. G. Sée gave as much as 14 ounces of raw meat daily in cases of chlorosis, and this with hydrotherapy he stated he had found succeed as a blood restorative after iron had failed. The digestive power for nitrogenous or other foods must be carefully watched, and, if necessary, aided by a few grains of pepsin and a few minims of dilute hydrochloric acid.

Besides animal albuminates, which should predominate in the diet at first, some easily digestible fat, especially if there has been any loss of flesh, should be added; progress in blood-making will often fail to take place until some digestible fat is added to the dietary. A moderate amount of butter or cream, or a dessertspoonful of cod-liver oil daily, may be ordered. The yolk of egg is an easily digested form of food, rich in iron. In anæmia with cardiac feebleness and loss of appetite the yolks of two or three eggs, beaten up with a little boiling water and flavoured with sugar and some spice, and with a teaspoonful or two of brandy added, are an excellent concentrated form of nourishment.

Food must be presented to such patients in an attractive and palatable form, especially when there is great indisposition to take food from entire loss of appetite. Simple easily digested farinaceous foods must be given to supplement the diet: our object should be to depart as little as possible from the normal mixed dietary of the healthy adult. A certain amount of wine, such as good sound Burgundy, with or without water, will be found useful, both as a stimulant and a sedative; or a glass

of porter or stout may sometimes be taken with advantage at bedtime, with a biscuit or some bread and butter.

2. Not less important is attention to the personal **hygiene** or habits of life of the patient. One of the most important of these is a life passed much in the open air in a salubrious rural district, or by the sea-side. Still greater improvement is often observed by a residence in elevated health resorts, of which there are many in Switzerland ranging from 3,000 to 7,000 feet above the sea level. Free exposure to the vivifying influence of sunlight and good air is one of the best blood restoratives we have. Hence it proves of great advantage to anæmic patients to be able to pass the winter in a climate where it is possible to be much in the open air, for such patients often tolerate badly exposure to cold and inclement weather, and when we advocate a life in the open air we wish to be understood to mean under genial climatic conditions. Such patients are often urged to take more physical exercise than they can, without incurring injurious fatigue and exhaustion; and at first, at any rate, it is best to restrict them to passive motion through the air, as in driving or sailing, and when some progress has been made in blood regeneration, gradually to encourage walking or riding exercise with a certain limited amount of interesting gymnastics. But with young and growing anæmic girls it will generally be found that enforced rest will often start an improvement that exercise has failed to bring about, and in such cases we often insist on an extra hour or two in bed of a morning, and an hour or two's repose in the afternoon, with the most manifest advantage. In some severe cases two or three weeks of confinement to bed may do much to expedite subsequent recovery. Many of these cases, standing as they do on the borderland between pure anæmia and neurasthenia, require somewhat the same management as the latter.

The usefulness of baths and the application of the methods of hydrotherapy to the cure of anæmia

have had many advocates, and we are greatly in favour of a judicious use of these methods in cases of anæmia which are found to be making but slow progress towards recovery. The application of douches and affusions to the skin, at first warm and then the temperature gradually reduced, or cold sprinkling of the surface, and especially of the spine, following warm affusion, and then brisk friction, is a great stimulant to nutrition and circulation and a calmative to the usually irritable nervous system. Such applications, combined with gentle massage, are of especial value in cases associated with insomnia. Care in diet, a life passed much in the open air, a careful apportionment of rest and exercise, the judicious use of hydrotherapy and massage, the strict limitation of both mental and physical work, the removal of all causes of emotional strain or excitement, and cautious inquiry into and correction of any possible sexual aberrations (for the evil habit of masturbation is a fruitful source of anæmia in both sexes), these are the principal hygienic means for the restoration of a normal blood state.

Undoubtedly an unhealthy condition of the gums and teeth may exert material influence on the production and maintenance of anæmia, and if such is present it must be treated at once and thoroughly by appropriate local measures. Such patients should also be instructed to brush the teeth night and morning with some antiseptic powder or lotion.

3. We must in the next place consider the **medicinal** agents which are best calculated to promote blood regeneration. In the first place we will dispose of the question of the value of aperients. When there is constipation—and this is a very common accompaniment of anæmic states—its removal must occupy the first place in our medicinal management of the case. We have not seen reason to believe, as has been urged, that constipation frequently stands in a causal relationship to anæmia. The cases which we have been accustomed to regard as cases of fæcal

intoxication induced by chronic constipation we should place in a different category, and indeed we have in a former chapter alluded to them; anæmia is certainly present in many of such cases, and can only be remedied by remedying the constipation. But we have never yet found those physicians who say they would prefer aperients to iron, in the treatment of anæmia, carry their preference to the extent of prescribing aperients only and withholding iron! Nor do we think if they began this method they would long adhere to it. We say this the more unhesitatingly because we have always advocated and practised the free use of aperients, in conjunction with iron and other remedies, in all cases of anæmia where constipation existed. But not in others. In some cases with irritable bowels, and no tendency to constipation, we have often found a combination of bismuth and iron answer far better than iron alone. The reason why aperients are of such undoubted value in cases of anæmia with constipation is obvious. They promote the activity of nutritive changes in a most direct manner, they remove abdominal congestions and quicken the sluggish circulation through the portal and other portions of the vascular system of the alimentary canal, they stimulate the action of the liver and of all the abdominal glands, they thereby increase the quantity and improve the quality of the digestive secretions; at the same time they sweep away any toxic substances which may possibly be formed from retained fæculent matter, and which might be absorbed into the blood; and further, no doubt the excessive development of sulphides from the decomposition of retained fæces leads to the formation of relatively insoluble iron sulphides, and so the iron in the food or that taken as medicine is wasted and lost. We see, therefore, what important agents aperients are in promoting blood regeneration when chronic constipation is associated with anæmia.

The bowels, then, must be kept adequately relieved, but in very obstinate cases we have found

it far better to discard all aperients by the mouth and to trust to long-tube enemata of simple water, or soap and water, with abdominal massage. Having succeeded by suitable methods in overcoming the constipation, we should, in our further treatment, take measures to prevent its return, and to maintain the due and regular activity of the bowels; for this purpose it is often a good practice to combine some aperient with such preparations of iron as we may select.

Iron, in the various forms at our disposal, is still, and probably always will be, the chief medicinal remedy for ordinary anæmic states. We are not able to say in what precise manner iron acts as a blood restorative; it has been stated, on experimental grounds, that all the iron given by the mouth may be recovered from the fæces; such statements have been received far too readily, and it is difficult to conceive such a series of experimental observations ever having been devised as would justify such a sweeping statement. It is something worse than foolishness to make such inferences from the results observed after injecting iron into the blood-vessels of dogs and rabbits. But it has been conclusively shown that inorganic iron salts are absorbed by the mucous membrane of the bowel, although the amount is always small, a few milligrammes a day. "After absorption it seems to be stored up in the liver, and to be converted into organic compounds resembling hæmoglobin in constitution, but more simple; and these ultimately form the hæmoglobin of the red blood-corpuscles."* It must, of course, be admitted that in cases of anæmia iron may be absorbed from the food in sufficient quantity to restore the loss of red corpuscles and hæmoglobin, and that therefore an abundance of good food and good air and other hygienic conditions may be attended by recovery, without the use of preparations of iron, or even after iron preparations may have failed. But these are

* Stockman, in Hare's "System of Practical Therapeutics" (new edit.), vol. i., p. 680.

exceptional instances, and some of the more severe and more intractable forms of anæmia will be found to arise in the midst of the very best hygienic surroundings, and will only recover when some suitable form of iron is administered, and administered for a long period.

It is well known that it is by no means a matter of indifference what form or preparation of iron is used in different cases of anæmia, and nothing is more common than to find a particular preparation succeed after many others have failed. In the first place we should examine carefully into the state of the digestive functions; if, with a coated tongue, there are loss of appetite, flatulent distension, and other signs of dyspepsia, we must endeavour to improve the digestion before we prescribe any form of iron, and some such formula as the following should be ordered:—

℞ Liquoris bismuthi citratis ... ... ℥iv.
Sodii bicarbonatis ... ... ℥ij.
Spiritus ammoniæ aromatici ... ... ℥iij.
Tincturæ nucis vomicæ ... ... ℥ij.
Infusi calumbæ ... ... ad ℨviij.

Misce, fiat mistura. Two tablespoonfuls an hour before food twice a day.

If there is constipation the following pill should be given daily, immediately before or after dinner:—

℞ Aloes extracti ... ... gr. jss.
Ipecacuanhæ pulveris ... ... gr. ss.
Quininæ sulphatis ... ... gr. j.
Saponis ... ... gr. ss.

Misce, fiat pilula.

This pill is far more effective when given an hour or half an hour before the last meal than after it.

Or we may prefer a combination of bismuth with some simple antiseptic, as follows:—

℞ Bismuthi subcarbonatis ... ... ℥ij.
Glycerini acidi carbolici .. .. ℥ij.
Magnesii sulphatis ... ... ℥ss.
Pulv. tragacanth. co. ... ... q.s.
Aquæ cinnamomi ... ... ad ℥xij.

Misce, fiat mistura. Two tablespoonfuls an hour before food, three times a day.

After a week or ten days of this treatment we shall usually be able to begin with one of the milder preparations of iron, and we may then add 5 grains of the ammonio-citrate of iron to each dose of either of the above mixtures, taken after food, and a grain of ferrous sulphate to each of the pills. Subsequently we may be able to replace the mixture with a modification of Blaud's pills which we have found most useful. In the modification which we use we do not attempt, nor desire, to decompose the whole of the ferrous sulphate by potassic carbonate, but to leave an excess of sulphate in the pill; we have no doubt of the superior efficacy of the following formula to that commonly used :—

℞ Ferri sulphatis exsiccati ... ... gr. lxxij.
Potassii carbonatis ... ... gr. xij.
Pulveris nucis vomicæ ... ... gr. xxiv.
Saponis ... ... gr. vj.

Misce et divide in pilulas xxiv. To be coated with a suitable covering. One to three after each meal.

In ordinary cases in which constipation is a prominent symptom the following modification of an old formula is one of the most rapid blood restorers we are acquainted with :—

℞ Ferri sulphatis ... ... gr. xvj.
Acidi sulphurici diluti ... ... ♏xl.
Liquoris strychninæ ... ... ♏xlvii.
Magnesii sulphatis ... ... ʒj.
Aquæ chloroformi ... ... ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls twice or three times a day, an hour before meals.

Some prefer to give the insoluble preparations of iron immediately or about an hour after food, in order that they may be dissolved by the gastric juice and so absorbed with the food; and in some cases where there is an intolerance of iron preparations this is a good plan. The ferrum redactum* in 2- or 3-grain

* The solubility of reduced iron in gastric juice has been estimated by Quevenne. When 50 centigrammes (7½ grains) of reduced iron were treated with 100 grammes (3 ounces) of gastric juice, 51 milligrammes were dissolved, or about one-tenth.

doses may be given in pill or powder, or the ferri carbonas saccharatus in 5- to 10-grain doses in the same manner thrice daily after food.

The best test of the activity of any preparation of iron is now at our service in the method of counting the number of red corpuscles, and of estimating the amount of hæmoglobin during its administration. It is desirable to apply this method of estimating the effect of our remedies on the process of blood regeneration, occasionally, during the treatment.

Many other preparations of iron are of especial value. The ferrum tartaratum and the vinum ferri are useful mild preparations of iron, and the latter is often acceptable to children. The syrup of the phosphate, the compound syrup of the phosphate, and the compound syrup of the hypophosphites are all valuable forms of iron, especially useful for children and young growing people. The last-named contains quinine and strychnine, and is very useful in the forms of anæmia following acute febrile and inflammatory diseases. The citrate of iron and quinine is also a very useful form in these cases, and is usually easy of digestion.

The syrup of the iodide of iron is particularly valuable in anæmias of scrofulous children with tendency to glandular hypertrophy. Lactates, albuminates, and peptonates of iron have been prepared, and prescribed with a view of presenting the iron in a predigested and readily assimilable form to patients who find a difficulty in digesting other forms of iron.

Ferratin, a combination of the iron salts with egg albumin, has been introduced to imitate the organic compounds of iron found in the tissues. It contains about 7 per cent. of iron, and, in doses of 15 to 30 grains a day, has been found of some service as a blood restorer. Ferro-glidine, a combination of iron with the albumin of wheat, is another compound of the same character, supplied in the form of tablets.

Attempts to administer preparations of iron by the intramuscular method have been made, but not with any striking success. We have ourselves made

extensive trials with the citrate of iron, cacodylate of iron, and the soluble arseniate, and in a large proportion of cases treated with each preparation have met with painful local reaction.

There is one point that must not be lost sight of in the treatment of anæmias by iron, and that is that the first effect of iron is to increase the number of corpuscles without increasing to a corresponding degree the amount of hæmoglobin; that the latter is of slower regeneration and needs a longer time to be re-established in the normal amount. We should therefore continue the administration of iron for some time after the regeneration of the corpuscles, and, indeed, for some time after the apparent restoration to health, as relapses are exceedingly common. In a case of average severity four months of continuous use of iron will usually suffice.

Certain inconveniences sometimes attend the administration of iron, but most of them are trivial or avoidable. Constipation is said to be frequently provoked by the presence of iron in the fæces, to which it imparts a black colour, due more probably to the conversion of the iron into sulphide than into a tannate, as has been suggested, for the black colour has been found even when the diet has been exclusively of milk. We have already insisted on the necessity of combining an aperient with the iron when there is any tendency to constipation. Then it is said to stain the teeth black; this certainly cannot be the case when given in the form of pills or enclosed in cachets, and very little risk would be incurred in taking the fluid forms of iron if the mouth were well rinsed out with pure water before and after the dose; and by pouring the dose well into the throat there need be little or no contact with the teeth. Gastralgia has also been said to be provoked by preparations of iron, but this is scarcely possible if the preparation selected be a mild one, and the dose given small or moderate. We are aware there is a prevailing belief that large doses are necessary in the

treatment of severe forms of anæmia, but we are satisfied that great care in the selection of the preparation, and in its mode of administration, will often avoid the necessity of those large doses, and we shall insist immediately on the activity of very small doses of iron when given in the form of natural mineral waters. Dujardin-Beaumetz showed how small is the actual quantity of iron lost by the blood even in the most advanced forms of chlorosis. According to his calculation, in a woman weighing 60 kilogrammes (a little over 9 stones) the amount of iron in the blood does not exceed 2 grammes (30 grains), and the most extreme anæmia does not reduce this amount by more than 50 centigrammes (7½ grains). But we must also bear in mind that the assimilation of iron, and the formation of hæmoglobin, are in such cases often very slow.

The efficacy of **natural iron waters** in the treatment of anæmic states makes it clear that the form and not the quantity of iron is of chief importance in blood regeneration. It is futile to assert, as some do, that it is the mode of life led at iron spas and not the iron water that is the chief restorative agent, because just the same mode of life can be led at any bracing seaside resort, but without the same results. No one with any knowledge of the localities would maintain that the air and life at Schwalbach were more tonic than at Folkestone, or the air and life at Spa than at Cromer or Whitby. At St. Moritz, no doubt, a very bracing and stimulating air comes to the aid of the iron cure, but many of the more feeble anæmics bear the St. Moritz cure badly unless they are prepared for it by three or four weeks at Spa or Schwalbach; then they are enabled to benefit by the more bracing climate of the Engadine, which will otherwise chill and depress them.

At these iron spas the water is richly charged with free carbonic acid, and the value of an iron spring is greatly dependent on the amount of free carbonic acid in it. When these waters are exported

some of this carbonic acid is necessarily lost, and there is a great tendency in the bottled waters to deposition of the iron in the form of oxide, which detracts greatly from the value of iron waters in bottle.

Spa, Schwalbach, St. Moritz, Pyrmont, are the best known of chalybeate springs; there are many others, almost as useful, which cannot here be enumerated. At all these Continental spas the water, richly charged with free carbonic acid, is used for baths, and the stimulating effect on the skin and circulation which these baths exercise is undoubtedly of efficacy in many cases.

It is rarely thought desirable to prescribe large quantities of these iron waters. One to two glasses (6 ounces each) about two hours after breakfast (11 a.m.), drunk slowly, slightly warmed if necessary, and at intervals of twenty or thirty minutes, and one or two more about five in the afternoon, are the usual amount, beginning with the smaller and rapidly increasing to the larger quantities.

Since many of the natural iron springs, as those of St. Moritz, contain a considerable amount of salts of lime, they occasionally cause constipation, and this must be guarded against by the use of some aperient water or salts, taken early in the morning. It is remarkable how certain anæmic patients, who do not improve with iron medication at home, appear to assimilate rapidly the iron of these chalybeate springs and quickly recover both tone and colour.

Young women who suffer from protracted anæmia will sometimes be well advised to substitute a course of arsenical waters for the annual visit to a chalybeate spa. La Bourboule, or the Tyrolese resorts Levico and Roncegno, afford such waters, coupled with pleasant, health-giving surroundings.

Preparations of manganese have been vaunted as blood restoratives equal in value to those of iron, and many physicians have combined the two, but Professor Hayem maintains, as the outcome of his careful and elaborate researches, that they are not

only useless, but injurious, as they interfere with the action of the iron salts.

Chloride of gold and sodium has some reputation in America as a blood regenerator, in doses of $\frac{1}{20}$ gr. increased to $\frac{1}{10}$ gr.

Arsenic we have not found capable of replacing iron in the treatment of ordinary symptomatic anæmias, but we have often found it a valuable auxiliary to iron, possibly from its faculty of stimulating the activity of the bone marrow.

Calcium salts are not infrequently a useful adjuvant to iron. The glycerophosphates of calcium and iron may be given in combination.

In the febrile cases of anæmia we should especially see that the bowels are freely evacuated daily, and we may combine quinine or arsenic with the preparation of iron given.

A preliminary treatment with an intestinal antiseptic, such as **β-naphthol,** in doses of 5 to 10 grains, before commencing the administration of iron, has been found advantageous in certain cases.

The addition of small doses of digitalis to the iron tonics, combined with rest in bed, has been found valuable in some cases where symptoms of cardiac debility were prominent.

In the **acute anæmia** that follows hæmorrhage the patient should be kept motionless in bed with the head low. If there is much collapse hot bottles should be placed around the patient, and full injections of saline solution should be introduced into the subcutaneous tissues as soon as possible. A claret glass of warm brandy and water will be a good diffusible stimulant, and will also help to allay thirst: sal-volatile may be similarly used. Recently pituitary extracts have found much favour in the treatment of collapse: an almost immediate effect is obtained by breaking the neck of a small glass ampoule of *pituitrin,* and allowing the contents to flow under the tongue. Restlessness is best relieved by a small hypodermic injection of morphine. Inhalations of

oxygen have sometimes been of use in this condition. After the urgent symptoms have passed, the further treatment will be conducted on the lines laid down for chlorosis.

Pernicious anæmia.—There is a tendency to regard this mysterious and remarkable disease as pathologically related to the preceding, but in its clinical features, its course, and its intractableness to almost all forms of treatment it differs very widely from it. This disease has often been observed to be preceded by symptoms of gastro-intestinal disturbance, or by nervous shock or worry, but it is usually insidious in its approach, and the first deviations from health noticed are languor and pallor of countenance, muscular feebleness, and indisposition to exertion. Feelings of faintness and breathlessness with a tendency to palpitations follow. The anæmic aspect is intensified, the visible mucous membranes become pale, and the skin assumes a waxy, "faded-leaf," or "lemon" tint; the muscles grow flabby, the appetite is lost, and the signs of cardiac and general feebleness become most marked; there is usually œdema of the feet and ankles, "the patient falls into a prostrate and half-torpid state, and at length expires." Pyrexia is common though irregular, the temperature rising to 101°, 102°, or even 104°F., but it rarely remains high for long. Plumpness of the body is often retained to the last. Gastro-intestinal symptoms, vomiting, and diarrhœa are common. The changes found in the blood in this disease are remarkable. Its specific gravity is reduced to 1038–1028, its alkalinity is lessened, and the solids of the plasma are diminished. The hæmoglobin is reduced in amount, but the reduction is not so great as in the number of red corpuscles. Hence the colour index is high. It is common to find about 1,000,000 red corpuscles, and 20 to 30 per cent. of hæmoglobin, giving a colour index of 1·25 to 1·5. Occasionally the colour index rises to 2. The red corpuscles may not form rouleaux. They also present great variations

in form and size (*poikilocytosis*); some are very small (*microcytes*), while a large number are above the normal size, 10 to 12 μ or larger. It is the presence of these large red cells (*megalocytes*), holding much hæmoglobin, that accounts for the high colour index. Most important, however, is the presence of large nucleated red corpuscles (*megaloblasts*), the nucleus staining less deeply than that of normoblast. Their presence in large numbers is peculiar to pernicious anæmia. Normoblasts may also occur, and various forms of degenerated red cells. In the white corpuscles there is a relative increase of small lymphocytes, 40 to 80 per cent. or more, and a corresponding diminution of polynuclear cells.

Retinal and other hæmorrhages are common. The urine is sometimes, but not always, found of a dark colour, due to the secretion of large quantities of pathological urobilin, and regarded by some as an evidence of excessive destruction of red blood-corpuscles. A notable feature of the disease is its intermittent character. Attacks may undergo apparently complete cure, only to relapse. These relapses occur at increasingly shorter intervals as the disease progresses, and the patient ultimately dies in an attack. Cases have been known to linger on for as long as five years, but a more common duration is two years, and in acute cases only a few months. If no case were considered cured within five years of the last attack, we should probably hear less of "complete cures."

Striking changes in the red bone-marrow have been found in this disease as well as in leukæmia. The essential changes in the red bone-marrow are (i.) its extension into areas normally occupied by the fatty marrow, much as in the case of a malignant tumour; and (ii.) the presence of megaloblasts of a character similar to those seen in the blood in this disease. These may be present in vast numbers, or may be scanty, but they are foreign to adult marrow in health. They occur in the fœtus, so that it has

been suggested that pernicious anæmia is a reversion to the fœtal type of blood-formation. It is not within the scope of this work to enter into the minute consideration of pathological discussions except in so far as they may influence our views of treatment, but a very brief reference to the main differences of opinion that exist amongst authorities as to the nature and causation of this malady may not be here out of place. It is generally thought, in view of the distinctive changes in the bone-marrow, that pernicious anæmia is primarily a disease of the blood-forming organs, and that the blood which is formed is abnormal and easily broken down, or that excessive destruction occurs as a sequel of imperfect formation. Possibly the imperfect formation is due to poisoning of the marrow by a special toxin, or it may be due to some congenital peculiarity, which makes the bone-marrow respond to an ordinary stimulus in this peculiar manner. Many, like Stockman, argue that pernicious anæmia is only an extreme condition, not a special form, of anæmia, that there is no real difference between it and the anæmia of hæmorrhage or wasting disease, and that its aggravated character is due to the occurrence and absorption of interstitial capillary hæmorrhages throughout the body. This view does not account for the fact that the marrow changes are *sui generis*, and quite unlike those met with after a continued drain of blood from any cause; moreover the condition of the blood in the two cases is quite distinct. Stockman would include in this group those remarkable cases of anæmia observed to occur in connection with the presence of certain parasites in the intestinal canal (*Bothriocephalus latus* and *Ankylostomum duodenale*). The blood, however, in these cases differs from that of pernicious anæmia in the presence of a large excess of eosinophiles: so that here we must admit, either that different toxins produce different effects on the bone-marrow, or that the marrow is capable of a different response to one and the same

irritant. Hunter and others, however, hold that the anæmia of wasting and malignant disease is absolutely distinct from pernicious anæmia, that failure in blood formation plays little or no part in its production, but that the essential nature of the blood change is excessive blood destruction, the portal blood being the chief seat of this process. Hunter concludes that pernicious anæmia is an infective disease, caused by the presence, under certain favourable conditions, of organisms of specific nature within the gastro-intestinal tract. He regards *oral sepsis* (dependent on dental caries) as the chief cause of the infection.

Other post-mortem appearances in pernicious anæmia comprise: excessive deposit of iron in the liver, spleen and lymph-glands; fatty degeneration of the heart and other muscles; degeneration or atrophy of the gastric and intestinal mucous membrane (which has been held to play a part in the causation of the disease); degenerative changes in the brain and spinal cord, and numerous hæmorrhages in any region.

Unlike chlorosis, males are more frequently affected than females. The youngest person Osler had seen with this disease was a girl of 20, but cases in much younger subjects have been reported.

During the commencement of the **treatment**, at least, the patient should be confined to bed, with free exposure to fresh air and sunshine. Full examination of the blood not less often than once a week is essential to intelligent treatment.

It is important in all cases to insist on the fullest and most nourishing diet a patient can take with advantage. But sometimes gastric pain and even hæmorrhage compel us to restrict food to a simple fluid diet.

Arsenic, suggested by Byrom Bramwell, appears to be the only drug that has been employed in the treatment of this disease with any good results. It has been given now in a great number of

cases, and in many with undoubted benefit. The sole difference of opinion which appears to exist as to its remedial effects is whether they are permanent or only temporary. It is usual to give it in the form of Fowler's solution, beginning with doses of 3 minims after food thrice daily, and increasing the dose every five or six days, first to 5 minims, then to 10, then 15, and finally 20 minims.

These large doses are usually well tolerated. Osler mentions a case in which the dose was gradually increased to 30 minims, and the beneficial effect persisted for nearly three years. When arsenic produces gastric irritation or diarrhœa it must be temporarily intermitted. We have sometimes found a pill of arsenious acid tolerated, when fluid preparations have excited irritability. **Cacodylate of soda,** $\frac{1}{2}$ to 1 grain, has been given subcutaneously, as a substitute for arsenic. At first the dose should be given only every other day. We have not found it as useful as arsenic by mouth.

Arsenic, of course, fails in some cases to produce any good effect, and there are grounds for believing that many cases reported as recoveries from the use of arsenic have subsequently relapsed; it is certain, however, that cases have remained well for from two to four years after the treatment. Perhaps more lasting results would be obtained if, after apparent cure, the arsenic were continued in small doses for a year or more, with return to larger doses at the first sign of relapse. Its mode of action is at present undetermined. It has been suggested that it stimulates the formation of new corpuscles by the red bone-marrow.

Byrom Bramwell* has reported great benefit from intramuscular injections of **salvarsan.** The dose of 0·2 or 0·3 gramme was given four times at intervals of about a fortnight or more. Our own experience is limited to its intravenous injection, but the results were no better than those habitually obtained from

* *Brit. Med. Journ.*, March 11, 1911.

the oral administration of arsenic. We gave 0·3 gramme in 250 c.c. of normal saline solution at each dose.

Prof. T. R. Fraser recorded a case in which he gave **bone marrow**, with the result that the patient made a remarkable recovery. The case was a very severe one, and repeated examinations of the blood displayed all the characters of pernicious anæmia. Arsenic and iron were first administered without producing any good results. Fresh ox and calf bone-marrow was then given to the extent of 3 ounces daily for five or six months. For a considerable part of this time salol (30 grains daily) was also given as an intestinal antiseptic. Barrs and others have also recorded instances of recovery under the use of red bone-marrow, both fresh and in tablets of the dry substance. But further experience has not corroborated these favourable views, and, unless it is combined with arsenic, no reliance can be placed on bone marrow. It is apt also to disturb digestion.

Iron is often useful in certain of these cases when combined with arsenic.

If oral sepsis is present, immediate treatment will naturally be called for, but we deprecate its routine adoption in all cases. Pyorrhœa alveolaris will require suitable dental treatment, and if we can isolate an offending organism we may have recourse to vaccine-therapy. Carious stumps should be removed, and antiseptic mouth washes, of which the number is legion, should be regularly used. The sore-tongue, which is sometimes a troublesome feature in pernicious anæmia, is very refractory to treatment. Borax and glycerine seldom has any influence upon it, and we prefer to use frequently a Listerine mouth-wash: sometimes no good result is obtained until the administration of arsenic is temporarily interrupted.

Gastric lavage has been recommended in cases in which gastric disturbance of septic origin appears to play a part, but we greatly prefer treatment with antiseptic drugs, such as bismuth salicylate, or

carbonate of bismuth combined with glycerine of carbolic acid, and great care in the matter of diet.

If diarrhœa is a troublesome feature it must be controlled by large doses of bismuth—15 grains each of the salicylate and carbonate, mixed with mucilage and cinnamon water, may be given three or four times a day: in severe cases an opiate may be added to this mixture. Cases associated with the presence of intestinal parasites must be treated, in addition, with parasiticide remedies—thymol for the *Ankylostomum duodenale* and *Filix mas* for the *Bothriocephalus latus* and other tapeworms.

If the intestine is the chief seat of trouble, such antiseptics as salol, naphthol, thymol, calomel, or cyllin in keratine capsules are indicated. Sour-milk preparations have been used for the same purpose. To combat the action of the poison in the blood after absorption, Hunter recommended the use of **antistreptococcic serum**, on the assumption that the presumed underlying sepsis was of streptococcal origin. We know that in the case of pyorrhœa alveolaris this is very seldom the case, and it cannot be said that such benefit has been derived from the antiserum as to warrant its employment.

ADDITIONAL FORMULÆ

Pills for anæmia

℞ Ferri et sodii pyrophosph., 3ss.
Extracti rhei, gr. xlv.
Extracti aloes, gr. viij.
Extracti taraxaci, q.s.
Ut f. pil. l. Two to be taken night and morning.
(*Bamberger.*)

Powders for anæmia

℞ Ferri carbonatis saccharati, gr. xv.
Sacchari albi, gr. lxxv.
M. et divide in pulv. vj. One night and morning.
(*Bamberger.*)

Aperient iron pills

℞ Ferri sulphatis, gr. xx.
Potassii carbonatis, gr. xx.
Myrrhæ pulveris, 3j.
Aloes socotrinæ, 3ss.
M. et divide in pil. xxx. Two or three a day. (*Brandes.*)

Pills for chlorosis

℞ Ferri ammonio-chloridi, 3ss.
Quininæ sulphatis, gr. xl.
Pulveris aloes, gr. xx.
Extracti taraxaci, q.s.
Ut f. pil. lx. Four to six daily.
(*Freriehs.*)

Mixture for chlorosis in the nervous and hysterical

℞ Ferri citratis, ʒj.
Potassii bromidi, ʒijss ad ʒiij.
Vini (Malaga), ʒviij.

M. f. mist. A tablespoonful three times a day. (*Siredey.*)

Pills for the same

℞ Ferri valerianatis, gr. xv.
Castorei, gr. xv.
Extracti rhei, q.s.

Ut f. pil. xx. Two to ten to be taken daily.
(*Dujardin-Beaumetz.*)

Mixture for chlorosis

℞ Ferri sulphatis, gr. xxiv.
Magnesii sulphatis, ʒvj.
Acidi sulphurici aromatici, ʒj.
Tincturæ zingiberis, ʒij.
Infusi gentianæ compositi ad ʒviij.

M. f. mist. A sixth part twice a day. (*Sir A. Clark.*)

Or

℞ Ferri sulphatis, gr. xxiv.
Sodii bicarbonatis, ʒij.
Sodii sulphatis, ʒvj.
Tincturæ zingiberis, ʒij.
Spiritus chloroformi, ʒj.
Infusi quassiæ ad ʒviij.

M. f. mist. A sixth part twice a day. (*Sir A. Clark.*)

A combination of arsenic and iron for chlorosis

Liquoris arsenicalis, ♏xxiv.
Ferri et ammonii citratis, ʒj.
Liquoris ammoniæ fortis, ♏xij.
Spiritus chloroformi, ʒj.
Aquæ ad ʒvj.

M. f. mist. One tablespoonful, after food, three times a day.

For hypodermic injection

A 4 per cent. solution of citrate of iron, 40 to 50 minims injected into the buttocks twice daily. When iron is not well borne by stomach. (*Lepine.*)

Pills for anæmia with gastralgia

℞ Ferri tartarati, ʒijss.
Extracti gentianæ, ʒij.
Extracti nucis vomicæ, gr. iv.
Extracti opii, gr. iv.

M. et divide in pilulas centum. Two before each meal.
(*Huchard.*)

Pastilles of lactate of iron

℞ Pulveris ferri lactatis, gr. lxxv.
Pulveris sacchari, ʒiij.
"Vanille sugar," gr. xlv.
Mucilaginis tragacanthæ, q.s.

M. Divide into 100 pastilles. Two to six daily.
(*French Codex.*)

Arsenic and iron mixture for anæmia

℞ Tincturæ ferri perchloridi, ʒv.
Liquoris arsenicalis, ʒj.
Glycerini puri, ʒj.
Aquæ ad ʒiv.

M. f. mist. A teaspoonful three times a day in a wineglassful of water after food.
(*Whitla.*)

Quinine and iron mixture

℞ Tincturæ ferri perchloridi, ʒv.
Quininæ sulphatis, gr. xl.
Glycerini puri, ʒj.
Aquæ ad ʒiv.

M. f. mist. A teaspoonful in water three times a day after food. (*Whitla.*)

CHAPTER XXII

TREATMENT OF CERTAIN BLOOD DISEASES: LEUKÆMIA—HODGKIN'S DISEASE—ADDISON'S DISEASE—EXOPHTHALMIC GOITRE—MYXŒDEMA

LEUKÆMIA OR LEUCOCYTHÆMIA: Characters—Symptoms—Course—*Treatment*—Tonics—Arsenic—Sodium Cacodylate—Salvarsan—Phosphorus—Oxygen Inhalations—Excision of Spleen—Douches—Electricity.

HODGKIN'S DISEASE, PSEUDO-LEUKÆMIA, OR LYMPHADENOMA: Characters—*Treatment*—Excision of Glands—X-Rays—Arsenic—Phosphorus, etc.—Animal Extracts.

ADDISON'S DISEASE: Characters—Symptoms—*Indications for Treatment*—Suprarenal Extract—Fresh Air—Tuberculin.

EXOPHTHALMIC GOITRE, GRAVES'S OR BASEDOW'S DISEASE: Characters—Course—Symptoms—*Treatment*—(1) Hygienic—Rest—Sea and Mountain Air—Hydrotherapy—Diet—(2) Local and Electrical—(3) Medicinal—(4) Serum-therapy—(5) Surgical.

MYXŒDEMA AND CRETINISM: Character and Nature of Disease—*Treatment*—Thyroid Grafting—Thyroid Extracts—Iodothyrin—Thyroid Feeding.

Additional Formulæ.

LEUKÆMIA

Leukæmia or **leucocythæmia** is a mysterious blood disease, of the causation and intimate nature of which we have but little precise knowledge. This disease is characterised by a persistent increase of the white blood-corpuscles. It occurs in two main clinical forms: the one characterised by considerable enlargement of the spleen, **splenic** or **splenomedullary leukæmia**, and there may also be enlargement of the lymphatic glands, especially late in the disease, but they are not usually enlarged: the other by enlargement of the lymphatic glands, **lymphatic leukæmia**, with a varying degree of enlargement of the spleen, and deposits of lymphoid tissue in other organs. As there are few, if any,

therapeutic indications to be derived from a consideration of the pathology, so far as it is known, and the symptoms of this disease, we shall briefly describe only the more salient points in its course and features. Of its etiology we know nothing. **Splenic leukæmia** appears to be primarily a disease of the red bone-marrow, which becomes semi-purulent in consistency, and extends into areas normally occupied by fatty marrow. There is a great increase of the *myelocytes* which are normally present. The changes in the spleen and lymph glands appear to be secondary, due to the deposition of cells from the blood, and to subsequent inflammatory changes.

In the blood the white corpuscles are greatly increased: they usually exceed 150,000 per c.mm., and may reach 1,000,000 or more. All forms are increased: polynuclears most, next the eosinophiles, and lymphocytes but slightly. A large number of abnormal forms serves, however, to lower the percentage of normal forms. There are (i.) myelocytes, usually of large size, with a faintly staining round, oval, or kidney-shaped nucleus, and fine granulations in the protoplasm—these form 20 to 60 per cent. of the total, and are rare in other diseases; (ii.) eosinophile myelocytes, like the above, but with large eosinophile granulations; (iii.) mast-cell myelocytes, large cells with faint nuclei and large granulations, which stain blue with Jenner's stain. These two forms are almost peculiar to this disease. There is usually a moderate degree of secondary anæmia, and normoblasts are almost invariably present.

Lymphatic leukæmia far too commonly follows severe oral sepsis for this to be regarded as a mere coincidence. The disease may be primary in the bone-marrow, which is converted into lymphoid tissue containing few, if any, cells other than lymphocytes; or in the lymph-nodes and in the spleen, which exhibits hyperplasia. In the great majority of cases it is a lymphocytic degeneration of the bone-marrow, just as

splenic leukæmia is a myelocytic, and pernicious anæmia a megaloblastic degeneration.

In the blood there is usually a great excess of white cells, but not so great as in the splenic form. The number of lymphocytes is greatly increased, forming from 80 to 90 per cent. of the whole. In acute cases the large lymphocytes often predominate, in the chronic the small. In some acute cases the total number of white cells is not increased, the whole change consisting in an increase of lymphocytes at the expense of other forms.

In *splenic leukæmia* the enlargement of the spleen may be very great, reaching as much as 18 lb. in weight. The liver also is more or less enlarged.

In *lymphatic leukæmia* the cervical, axillary, mesenteric, inguinal, and other lymphatic glands may be enlarged. The liver is also frequently enlarged, and is recorded to have attained, in one case, a weight of more than 13 lb.

The **symptoms** of this disease come on as a rule insidiously; progressive abdominal enlargement from splenic hypertrophy, or enlargement of superficial lymphatic glands, is first noticed, accompanied with pallor, dyspnœa, palpitation, and other signs of anæmia. There is a great tendency to hæmorrhage from internal organs, and especially to epistaxis, and retinal hæmorrhages also are common. Gastro-intestinal symptoms, nausea, vomiting, and grave diarrhœa are frequent. As in pernicious anæmia, an irregular pyrexia is often observed, and the temperature may rise at night from time to time as high as 103° F., or even higher. Various other symptoms may appear, dependent on the defective nutrition of organs, from the altered state of the blood, or from pressure of the splenic tumour, or enlarged lymphatic glands. Recovery is rare, and the greater number of cases end fatally in from one to three years.

Acute forms of both splenic and lymphatic leukæmia are met with in which a fatal result may follow as early as four or five weeks after the first

symptoms have been noticed. The disease presents the same characters as in the chronic form, only intensified in degree.

With regard to the **treatment** of this disease: the best results seem to have been derived, as in pernicious anæmia, from the use of arsenic. Large doses have been given, as much as 20 minims of Fowler's solution three or four times a day, and a great reduction in the proportion of white corpuscles has been registered under this treatment. But it is best to begin with ordinary doses and increase them gradually. Osler states that he has repeatedly seen improvement under its use, but, at the same time, points out that there are "curious remissions in this disease which render therapeutical deductions very fallacious." He has seen marked improvement without special treatment in a patient who, he says, "from a bed-ridden, wretched condition, recovered strength enough to enable him to attend to light duties." **Sodium cacodylate,** a non-irritating form of arsenic, which can be taken in much larger doses than the ordinary official preparations, has been given in this disease both hypodermically and by the rectum, and encouraging results have been reported in some instances. For hypodermic injection a sterile, standardised solution can be obtained in capsules, the daily dose being $\frac{3}{4}$ grain or 1 c.c. of the solution. For rectal injection the same dose is given, but more diluted—i.e. with about 4 drams of boiled water. We have recently had the opportunity of trying intravenous injections of **salvarsan** in chronic cases of both lymphatic and spleno-medullary types, but we have no resultant benefits to record. The doses given were 0·3 gramme in 250 c.c. of normal saline solution. Phosphorus also has been given in doses of $\frac{1}{30}$ grain in pills, thrice daily, some have thought with benefit.

Red bone-marrow is as ineffectual in this disease as in pernicious anæmia.

Da Costa and others have advocated the use of

oxygen inhalations. The former has given 100 gallons daily with benefit. Sticker of Cologne has also reported a marked decrease in the actual and relative number of white corpuscles under the influence of oxygen inhalations, together with a large absolute increase in the red ones. The improvement was not, however, maintained; the spleen continued to increase in size, and the patients succumbed to the disease a few months later. It would have been remarkable if, in the present "surgical age," excision of the leukæmic spleen had not been proposed as a remedy for this disease. This operation has been performed forty-five times with five recoveries! *

The splenic enlargement is said to have been reduced by means of cold douches to the left hypochondrium, or by passing a galvanic or faradic current through the hypertrophied organ, the positive pole being placed over the tenth rib and the negative over the enlarged spleen. We have often found continuous application of an ice-bag afford much relief to the pain which seems to result from rapid splenic distension.

Improvement in cases of chronic spleno-medullary leukæmia has followed exposure of the spleen and bones of the extremities to the X-rays: the improvement has consisted chiefly in a great reduction of the total number of leucocytes, and in the disappearance or diminution of pathological forms, together with decrease in the size of the splenic tumour, and some general betterment. The X-rays seem to act not only by increased destruction of leucocytes, but also by checking their formation. They exert no apparent influence on lymphocytes, and this may account for the complete absence of any sign of improvement in cases of lymphatic leukæmia. We cannot, however, claim more than temporary benefit for this line of treatment, and relapse seems invariably to recur, with diminished reaction to the X-rays, and ultimately death. The treatment should be undertaken only by

* Osler, "Practice of Medicine" (8th edit.), p. 746.

a skilled radiographer, so as to avoid troublesome burns, and the physician must be alert to note any evidences of undue general reaction at the same time that he follows carefully the alterations in the blood.

In all these cases it is needful to protect the patient from the influence of unfavourable surroundings. He should, when possible, live in an airy, healthy locality by the sea coast, or in the open country in a dry situation; he should have a carefully adapted, nutritious, and well-prepared diet; he should be made as free from mental worries as possible; and he should be protected from all exposure to cold and from the danger of sudden chill. Physical rest with pleasant surroundings is preferable to attempts at active exercise, which tend rapidly to exhaust and enfeeble such patients. As in most incurable maladies, many other remedial agents have been tried, but none, beyond those that have been mentioned, with any notable benefit.

Hodgkin's Disease, Pseudo-Leukæmia, or Lymphadenoma

This disease, which is supposed by some to have some pathological affinity with the preceding, is characterised by a progressive enlargement of the lymphatic glands, together with symptoms of anæmia. Secondary growths of lymphoid tissue have also been found in the liver, spleen, and other organs. The spleen has been found enlarged in three-fourths of the cases, but not to anything like the same extent as in leukæmia. The enlargement of the glands is a simple hyperplasia, affecting the cellular elements chiefly, and to a less extent the supporting reticulum. The causation of this affection is as obscure as that of the preceding. It is more prevalent in males than in females, and in young than in old persons. In some cases the glandular enlargements have been thought to be traceable to local irritation. Carious teeth seem at times to originate cervical lymph-

adenoma. Murray * thinks "the changes we find in the adenoid tissues and lymphatic glands are most easily explained by assuming that they are the result of the action of some pathogenetic parasite," and this view he considers receives support from the fact that this disease appears in cattle, dogs, horses, and other animals. Organisms have been found in the enlarged glands by some observers, but no definite conclusions on this head are at present warranted. The disease seems to have some ill-defined relationship to tubercle. The two diseases often coexist, and it is difficult to regard tuberculosis as always a mere secondary infection.

The first **symptoms** noticed are, usually, enlargement of the glands of the neck, axilla, or groin; these are at first distinct and movable, but they tend to fuse together, and may come to form tumours of considerable size. When the deeper-seated glands become affected, as, for instance, the bronchial and mediastinal glands, serious pressure signs may develop, the chief of which are pains in the chest and dyspnœa; and the symptoms resulting from pressure of the immensely enlarged glands in other situations are often amongst the most serious manifestations of this disease. There is apt to be great variation in the rate of growth and size of the glands. At first the blood may show no changes at all; but in the later stages there is progressive anæmia of simple secondary type. In a few cases the number of leucocytes is greatly increased, bringing this affection into relationship with splenic leukæmia. As in the latter disease, there is a tendency to hæmorrhage, and especially to epistaxis, and the temperature of the body, too, often rises to from 100° to 103° F. or higher. Curious ague-like paroxysms have been observed in some cases. When cases do not terminate by pressure of the enlarged glands on important structures, the course of the disease is somewhat variable, but with a

* Allbutt and Rolleston's "System of Medicine," vol. iv., part i., p. 467.

decided tendency to a fatal termination. Some cases run a rapid course, group after group of glands being successively involved, and death may occur in two or three months; or periods of quiescence may alternate with periods of activity, and chronic cases may last several years. As the fatal termination approaches, usually from exhaustion, after the development of a cachectic state with progressive anæmia, the glands have, in some instances, been observed to diminish in size and even disappear. Very rarely the disease seems to come to a standstill without apparent cause, and the enlarged glands shrink to flaccid inactive residues.

Treatment in these cases, as in the preceding affection, has not been attended with any great amount of permanent success, and in this disease, as in the other, the strongest testimony is in favour of arsenic.

Two indications are obvious. First, to prevent, if possible, the spread of the disease by attacking the structures first affected; and, secondly, to strengthen the resisting power of the patient.

When the glands are small and localised, removal has been advocated so as to check the spread of infection from them. But this is only to be recommended when the enlargement is confined to a single group of glands, when the spleen is not enlarged, when fever is absent and the anæmia is not advanced. In a few instances on record such operative interference seems to have checked for some years, at any rate, the advance of the disease. Operation may also be thought necessary if an enlarged gland should compress the trachea or some important nerve or vessel. Some physicians have found great temporary benefit from repeated exposure of the glandular tumours and spleen to the X-rays, but our own experience of the procedure has been less satisfactory. Other local measures have been tried, such as injection into the substance of the glands of carbolic acid, iodine, arsenic, and other drugs, the applica-

tion of galvano-puncture, massage, hot and cold douching, blisters, iodine externally; but all to little purpose. Treatment at Kreuznach or Woodhall Spa has been thought serviceable in some cases. Not infrequently the pressure of the enlarged glands causes great pain and sleeplessness, for which there is no remedy but morphine.

Of all remedies, the internal use of **arsenic** seems to be the only one in which any confidence can be placed, even to produce temporary alleviation of symptoms. At the commencement ordinary doses may be given, viz. 3 to 5 minims of Fowler's solution, and this may be increased gradually up to 20 minims three times a day, in the absence of toxic symptoms; should such arise, the drug must be discontinued for a few days. It is best given immediately after food, in milk or milk and water.

Its remedial action may be germicidal, or it may antagonise some chemical poison. Phosphorus has also been employed, and a reduction in the size of the glands has been noted during its use. General tonics, such as quinine and the phosphates and iodides of iron, may be given, but more particularly good air and good and supporting food should be carefully provided.

It would have been remarkable if, in the tendency prevailing at the present time, the employment of animal extracts, in an irrational manner, had not been recommended in these cases. Thymus extract, splenic extract, and bone marrow have all been tried, but we are not aware that any decisively good results have been obtained.

Addison's Disease

This is a disease which in recorded cases has generally terminated fatally in spite of all remedies that have been applied.

It is usually associated with tuberculous disease of the suprarenal bodies, very rarely with simple atrophy or other destructive disease. Morbid changes

in the abdominal sympathetic nerves and ganglia, without apparent disease of the glands, have also been described. Such changes are usually of a cicatricial type, and may interfere with the nerves that control secretion, or, by obliterating the lymphatic and vascular efferent channels, shut off the secretion from the general circulation. We have no definite knowledge of its causation or its pathology, but some cases appear to have followed blows upon the back or abdomen, and others to have been preceded by caries of the spine. Much discussion has arisen, and much laborious investigation has been carried out, with the view of throwing light on the manner in which the changes in the suprarenal bodies produce the symptoms of this disease, and the prevailing opinion is that they are due to an inadequate supply of suprarenal secretion. The profound fall of blood-pressure favours this explanation. It is true that extirpation of the suprarenals does not produce the symptoms of Addison's disease, but these are essentially the products of a chronic morbid state. The disease is characterised by great asthenia, especially affecting the circulatory organs, by gastric irritability, and by a peculiar pigmentation of the skin and some of the mucous membranes, as those of the mouth, conjunctiva, and vagina. It should be noted that occasionally the thymus and spleen have been found enlarged. Symptoms which may require treatment are nausea, vomiting, diarrhœa, and great cardiac and general feebleness and tendency to syncope. The disease usually ends fatally, and sometimes runs a rapid course, from the first detection of symptoms terminating in a few weeks. Occasionally it is prolonged for years, and in rare instances recovery appears to have taken place; at any rate, long periods of improvement under appropriate treatment are frequent. Acting on the hypothesis that the symptoms in this disease are due to suprarenal inadequacy, the first indication in treatment is clearly to administer the active principle of suprarenal gland. It should be possible

to control Addison's disease by administration of **suprarenal extract**, as readily as myxœdema by thyroid extract, subject to localisation and subsidence of the tubercular process. Such, however, has not hitherto been the case. Adams* has summarised 97 cases of Addison's disease treated by suprarenal extract: 7 cases were made distinctly worse, 43 derived no real benefit, 16 appeared to be permanently relieved. Improvement is usually most marked in the relief of asthenia, but in many cases pigmentation has diminished or disappeared, and some relief has been afforded to circulatory enfeeblement. Complete recovery is extremely rare. Our own experience, however, includes a single instance in which, by a combination of suprarenal medication with open-air treatment, a pronounced and typical case emerged from a moribund state into robust health, with disappearance of all symptoms, and a gain of 5 st. in five months. In our opinion much of the failure of this treatment may be set down to the method of its employment. It is unreasonable to expect that it should arrest the tubercular process; and yet almost invariably we find that, when suprarenal extract is administered, measures calculated to arrest the tubercular process have been neglected. Again, a large number of the preparations employed have been prepared from the whole gland, though the sole active principle, isolated as yet, resides only in the medulla; and this initial fault has not been adequately corrected by careful physiological standardisation. In nearly all recorded cases the extract or dry substance has been given by the mouth; yet it is asserted that adrenin is destroyed in the stomach. The same objection of its local destruction has been brought against subcutaneous administration, but with doubtful justice, as there is no question of at any rate a marked and rapid rise of blood-pressure in Addison's disease when suprarenal extracts are administered subcutaneously.

* *Practitioner*, Oct., 1903.

A further possible cause of failure may lie in the fact that with subsidence of pressing symptoms treatment is apt to be suspended. The usual preparation supplied to patients is a tabloid of dry suprarenal substance, representing about six times its weight of fresh suprarenal gland; an initial dose of two 5-grain tabloids a day will suffice, and may be cautiously increased. For hypodermic use either Parke, Davis & Co.'s adrenalin chloride 1 = 1,000, or Burroughs & Wellcome's "Hemisine," is a suitable preparation. Should none of these preparations be available, fresh glands should be procured, minced fine, with herbs to cover the taste, and given in bread sandwiches. Good air, and abundance of it, night and day; good food, but light and nutritious, are essential adjuncts of the treatment.

Tuberculin has been used in cases of Addison's disease, but the results have not at present been such as to encourage us to give it a trial, and run the risk of a severe reaction in a class of patients who are already on the brink of collapse from essential asthenia.

The other indications for treatment are chiefly symptomatic; for the gastric irritability lime water, creasote, hydrocyanic acid, and iced champagne may in turns be required; and for the diarrhœa bismuth and catechu may be prescribed. Iron has been given in full doses with apparently good effect in some cases, and arsenic and strychnine have proved valuable at times. Alcoholic and other stimulants, such as ammonia and ether, may be needed to ward off attacks of syncope when they threaten.

The patient's strength must be considered by every possible means. All worry and excitement must be avoided, and when the asthenia becomes extreme rest in bed must be enforced.

The tendency to death from syncope must be borne in mind and provided against. Death has not infrequently resulted from allowing the patient to sit up in bed.

Exophthalmic Goitre, Graves's Disease, Basedow's Disease

It will be convenient to consider in this chapter the treatment of this remarkable affection, which, although primarily a disease of the thyroid gland, is especially marked by circulatory and nervous disturbances.

The most characteristic signs of this disease are exophthalmos, or prominence of the eyeballs; enlargement of the thyroid; functional excitement of the heart, or palpitation; and a fine generalised muscular tremor. These signs are by no means invariably present, and it is usual to speak of a *forme fruste*, in which one or other of the cardinal signs is absent. Its mode of origin is obscure, but it is much more frequent in women than in men, and is most apt to occur between 20 and 30 years of age. Depressing emotions, worry, fright, or nervous shock of some kind have frequently been noticed to precede the onset of this disease, and heredity would appear to have an influence in some cases.

The onset of the **symptoms** is usually gradual, and the disease generally runs a chronic course; but Osler refers to two rapidly fatal cases occurring in the Philadelphia Hospital—one with marked cerebral symptoms, and another in which death occurred from vomiting and diarrhœa on the third day of the illness, and other acute cases have been recorded from time to time. Palpitation is usually the first symptom complained of, with shortness of breath, and the heart's impulse is felt to be greatly increased in force, and all the visible arteries are observed to throb and beat strongly. The heart-beat may vary from 100 to 160, or even more, and it is readily excited by any emotional disturbance. Soft systolic murmurs at the base of the heart are common. The prominence of the eyeballs is early noticeable; at first slight, it may become so considerable that the eyelids cannot close completely, and it has been

known to reach such a degree that the eyeball has been dislocated from the orbit. What is known as von Graefe's sign is that when the eyeball is moved downwards the upper lid does not follow it with the habitual smooth simultaneous movement. There is also sometimes spasm or retraction of the upper lid. The enlargement of the thyroid may be general, or it may be limited to one lobe; at first soft and yielding, it becomes later unduly firm, when fibroid changes have occurred. Its vessels are much dilated, and occasionally the whole gland is found to pulsate with a thrill. The patients are usually, at the same time, anæmic, emaciated, febrile, and highly nervous. They complain of painful flushing and distressing perspiration. Pigmentary changes in the skin are often observed. Gastro-intestinal irritation, with vomiting and diarrhœa, is not infrequent, and in grave cases the latter symptom may prove very intractable. Great irritability of temper and mental depression usually manifest themselves, and in a small proportion of cases actual insanity.

Recovery is not uncommon in the milder cases, and is sometimes rapid, but many of the severer forms prove intractable. Relapses are also common. It has been noted that myxœdema sometimes follows closely on exophthalmic goitre.

The pathogeny of exophthalmic goitre is far from settled; the only constant lesions found post mortem are hypertrophy of the thyroid gland and persistence or even hypertrophy of the thymus. Most of the symptoms of the disease may be referred to hypersecretion or perverted secretion of the thyroid gland. Still we are as far as ever from knowing under what influence thyroid hypertrophy occurs. A microbial origin has been postulated, but on no substantial grounds. Others have related it to atrophy of the parathyroids, and it is noteworthy that, in diseases of the ductless glands, there is a tendency to involvement of other glands than that chiefly and perhaps primarily affected, as though the secretory equilibrium

of all were disturbed by disease of the one. Bearing in mind the important influence of thyroid secretion on the nutrition of the central nervous system, and the invariable nervous antecedents of the victims, some have held that the *causa causans* resides in some obscure disturbance of the central nervous system. Still it must be admitted that such coarse lesions of the nervous system as have been observed are mere accidents of the disease, and in no sense causative.

We may consider the **treatment** of this affection under three headings: (1) Hygienic, including rest, change of air, hydrotherapy, and suitable food. (2) Electrical treatment. (3) Medicinal, including the treatment of symptoms. Cases, however, differ so much in their symptoms that no hard-and-fast rules of treatment can be laid down. Each case must be treated on its merits.

1. Much repose in the recumbent position is imperative, but, except in severe cases, the patient need not be confined to bed, especially if such confinement is felt to be irksome and annoying: massage may then appropriately be employed. All cause of excitement, mental and physical, should be carefully avoided, and everything that is possible should be done to promote a cheerful and hopeful frame of mind. Some physicians maintain complete rest in bed for a period of months in all cases of any considerable degree of severity. When wasting is marked and the nervous symptoms are prominent the Weir-Mitchell treatment may be required.

Change of air and scene, with restful and invigorating surroundings, is of the very greatest importance. In spite of statements to the contrary, we desire to state emphatically that we know of no such remedial influences, in remediable cases of this affection, as a prolonged residence at a suitable seaside resort or a well-selected mountain resort of moderate elevation. We should not recommend patients with this disease to seek, as a rule, an exciting climate like that of the Western Riviera,

nor should we recommend them to incur the risks of the frequently chilling air of such elevations as Davos or the Engadine; but in such seaside resorts as Brighton, Westgate, Folkestone, or Biarritz, which present a combination of the sedative and tonic effects of sea-air, or at such moderate elevations as Glion, Sonnenberg, Aussee, or even Engelberg and St. Beatenburg, some of the very best results have been obtained; we refer, of course, to the summer season in the mountains. Eulenberg has advocated high-altitude sanatoria, but he prefers sub-Alpine ones when dyspnœic symptoms are prominent. Much misapprehension exists as to the effects of such moderate elevations as these on the circulatory organs; in the first place, the sedative effect on nervous states which such resorts commonly produce reacts most favourably on the circulatory organs, and the purity and tonic quality of the air have a general strengthening and restorative effect. In a good season, sitting out of doors for many hours of the day is possible, and the moral effect of cheerful surroundings and pleasing scenery is not to be overlooked. A systematic open-air treatment frequently proves of much benefit, and affords relief to the overheated sensations that are so common in this disorder. Whenever, then, the patient is able to bear the fatigue (and the expense) of removal, either to a suitable sea-coast or mountain resort, this should be the first consideration, and we can assert that it is capable of effecting a cure in many cases without any other treatment.

A modified course of **hydrotherapy** in a good bracing locality has also much to recommend it, and has been found of decided benefit in certain cases. The effervescing saline baths of Nauheim are sometimes found to soothe and strengthen the heart, and a good artificial substitute may be prepared with Sandow's tablets. Nothnagel recommends tepid half-baths, irrigations, packing, and the cold spinal bag. Jaccoud advises tepid or warm douches daily for 25 or 30 seconds. After a time their temperature may

be reduced until at last they may be given quite cold; but he very properly warns against beginning with cold douches, as in these nervous patients they often aggravate the cardiac excitement.

The **diet** should be of a nutritious but bland and unstimulating character. So long as digestive power is unimpaired an ordinary mixed diet may be given, supplemented by as much milk as the patient can comfortably take. Alcoholic drinks, and tea, coffee, and tobacco should be avoided. Great reliance is placed by some physicians on an exclusively milk diet; but when the heart is weak some additions must be made to this in the form of pounded meat, or fish, or chicken, or clear soup, and a little red wine in some cases. Whenever disorders of the digestive organs are present, such as gastric catarrh or diarrhœa, great attention must be paid to the diet, which should consist chiefly of milk and bland farinaceous foods, such as tapioca, sago, arrowroot, and the like. In every case the weight should be recorded from week to week, as affording a reliable indication of progress or the reverse.

2. In the next place we must consider the value of **electrical** treatment.

Exposure of the goitre to the action of the X-rays has not in our own experience been attended by results of a very encouraging kind, but F. A. Stoney* has recorded a series of 48 cases, in most of which she claims to have produced great amelioration: 14 were cured, 22 much improved, 5 slightly improved, 7 ceased treatment, which in some of the successful cases required fifty attendances. Her dosage never exceeded half the Sabouraud "B," with the tube fully six inches away.

Testimony as to the efficacy of local electrical treatment is almost universal. We cannot, however, share this opinion. We have ourselves observed it cause great aggravation of all the symptoms in the case of a highly nervous and sensitive patient.

* *Brit. Med. Journ.*, Aug. 31, 1912.

We also note that, in all the cases reputed to have been benefited by this method of treatment, it has been applied regularly for some months. Now, we have observed very remarkable improvement from change of air alone in this period, and the value of this treatment, upon which we do not desire to throw any doubt, must rest on the benefit it confers on patients who cannot at the same time avail themselves of suitable change.

Horsley asserts that, if the faradic current be applied for several hours a day persistently, every elementary or early case of exophthalmic goitre can be arrested. Our own experience, however, has convinced us that this dictum must be accepted with much reserve. Murray* regards it as often valuable. Flat electrodes, moistened with warm salt solution, should be placed over the goitre and at the back of the neck. If the patient is herself to administer the treatment, they may be strapped in position, and connected with the secondary circuit of a dry-cell faradic battery. The current passed should be just strong enough to excite a pricking sensation in the skin, and should be employed for an hour, twice a day, and sometimes even for longer periods. The important point is perseverance for weeks or months.

Nothnagel advises galvanism through the medulla and the cervical sympathetic. Charcot recommended the faradic current to be applied to the eyelids, the thyroid, and the cardiac region. Osler admits that many cases have derived temporary improvement from the use of the galvanic current, the cathode being placed at the back of the neck, and the anode along the course of the sympathetic or over the heart. Jaccoud considers the best form of electricity to employ is bilateral galvanism of the neck, daily, by means of weak continuous ascending currents.

3. We now come to the question of **medicinal** treatment, and here we encounter, as might be expected, great diversity of opinion. We agree with

* *Brit. Med. Journ.*, Nov. 11, 1905.

Nothnagel in believing that medicines "are of little use" as direct curative agents, but we believe that as auxiliaries and for the relief of symptomatic conditions suitable medicines will be found of very great value. Fagge asserts that iron seldom or never does good, and that digitalis has no power in tranquillising the heart. Osler, on the other hand, advises a combination of digitalis and iron when there is marked anæmia, and Nothnagel commends a combination of iron and bromides. We have frequently given iron in combination with sodium bromide with very great advantage in the milder forms of this disease associated with anæmia in young women. We always use a mild preparation of iron, generally the ammonio-citrate, and we give 5 to 10 grains of this thrice daily with 10 grains of sodium bromide, with the effect of benefiting the anæmia, quieting the nervous excitement, and lessening palpitation. Digitalis we have found a "two-edged sword"—in some cases it will quiet the action of the heart and reduce the pulse-rate, but in others it seems to increase the cardiac excitement and to make matters worse; and its tendency to cause gastric irritation is more manifest in this disease than in any other. On the whole, we think it should not be commonly prescribed in this disease. Several trustworthy observers testify that strophanthus, 5 minims of the tincture three times a day, quiets the cardiac action and is of real service in this malady. Cactus grandiflorus, the fluid extract and the tincture, the former in doses of 5 minims, and the latter in doses of 10–45 minims, three times a day, has also been found of marked value in some cases. Friedreich advises the continued use of quinine; we agree with Jaccoud that it often fails to agree with these patients. Arsenious acid is a favourite remedy of Jaccoud's; he gives $\frac{1}{32}$ grain, twice a day, with the food, and increases the dose, with intermissions, up to $\frac{1}{16}$ grain. Murray recommends prolonged administration of liquor arsenicalis, adding to each dose 10–15 minims of tincture of

convallaria if the pulse-rate is high, and 10 grains of potassium bromide if nervous symptoms are troublesome. Cacodylate of sodium has been found useful in many cases, and is a preparation which permits of the use of arsenic in larger doses. Besides the bromides, which are very useful in allaying the troublesome nervous symptoms and insomnia, we have also found valerianate of zinc, a grain three times a day, valuable for the same purpose. The bromide and iodide of strontium mixed have been given with much improvement in certain of the symptoms. Dr. Metcalfe,* of Bradford, has found benefit from 10- to 20-minim doses of dilute hydro fluoric acid in water three times a day. Iodine and the iodides must be employed cautiously, as in some cases, owing to their stimulating the secretory activity of the thyroid, they merely aggravate the symptoms. The red iodide of mercury ointment is a suitable preparation for application to the goitre. It should be diluted to one-third of its pharmacopœial strength, and rubbed in gently night and morning, with intermissions in the case of any local soreness or exfoliation of the cuticle.

Belladonna has a certain amount of testimony in its favour, and made into a collodion it has been painted over the thyroid enlargement. There is no evidence that belladonna diminishes thyroid secretion, but it sometimes checks the troublesome perspiration. We do not advise the use of such depressors of cardiac force as aconite and veratrum viride, recommended by some authorities; the cardiac force does not need depression, but regulation.

The use of sodium phosphate—from ½ dram to 2 drams daily—has had many advocates. It is quite harmless, and should therefore merit a trial. Dr. Meltzer combines the use of thymus gland with this salt.† He gives the thymus minced raw

* *Brit. Med. Journ.*, Aug. 31, 1912.

† Hare's "System of Practical Therapeutics" (new edit.), vol. i., p. 617.

in wafers. We have failed to detect any even remote benefit from preparations of thymus gland. Suprarenal medication has now and again seemed to improve the general condition for a time. The routine use of thyroid extracts is irrational, and frequently injurious; but thyroid enlargement seems at times to be a compensatory hypertrophy, having for its object the restoration of secretory equilibrium, that has been upset by disorder of some other ductless gland. In such cases administration of thyroid extract is followed by steady decrease in size of the enlarged thyroid.

Vomiting may require the exhibition of bismuth, hydrocyanic acid, and alkalis; or even recourse to rectal feeding, and the hypodermic injection of morphia. The diarrhœa in the later stages of this disease often becomes most intractable, and may require the use of opiate enemata—10 grains of Dover's powder and 20 grains of tannin mixed with 2 ounces of starch may be thrown into the bowel twice a day if necessary. We have found the tincture of coto, in 10- to 20-minim doses, mixed with a dram of compound tincture of cardamoms, a dram of mucilage, and an ounce of chloroform water, one of the best internal remedies for this symptom. The use of the aromatic sulphuric acid, in 20-minim doses, three times a day, has been found to give very good results. Preparations of tannin, such as tannigen and tannalbin (3–8 grain doses of the former, and 8–15 of the latter, in cachet), may be of service also.

In extremely violent attacks of palpitation various expedients have been suggested: our own experience is in favour of the hypodermic administration of a full dose of morphia, along with the continuous application of an ice-bag to the heart.

Conjunctival inflammation is at times a troublesome complication, and should be met by bandaging a cold compress over the eyes.

Of late years much effort has been expended on

attempts to prepare **serums** and other substances directly antidotal to the thyroid toxæmia. Moebius prepared a serum (anti-thyroidin) from thyroidectomised goats. He presumes that the function of thyroid secretion in health is to neutralise some collateral toxin, which in the absence of thyroid activity will accumulate in the body fluids. His serum, therefore, aims at administering a toxin for the purpose of neutralising the excess of thyroid secretion. We have ourselves failed to detect any result from its use, either good or bad, and this at great pecuniary expense. The serum may be given by the mouth in milk, in doses of ½ dram twice a day, gradually increased. Rodagen, a powder prepared from the milk of thyroidectomised goats, has likewise proved ineffectual in our hands, in doses of ½ dram three times a day. More recently thyroidectin, a powder prepared from the blood of thyroidectomised animals, has been prepared on the same lines. Of these three remedies we need only say that the whole rationale of their preparation seems to us to be illusory.

The production of a **thyrocytolytic serum** by Rogers and Beebe at any rate rests on a scientific basis, but as yet we are unable to pronounce on its value.

The belief that many, if not all, the symptoms of exophthalmic goitre are referable to hypersecretion of the thyroid gland has naturally led to the attempt to relieve the symptoms by **partial thyroidectomy.** Formerly regarded, and rightly, as an operation involving the gravest risks to the patient, this operation is now one that is amply justified by results, if sufficient care is observed in the selection of the patient, the time for the operation, and its technique. Severely acute thyroid intoxication, marked secondary disorder of viscera, more particularly the heart, and great nervous excitability absolutely forbid operation. In fact it is just those cases that are most amenable to medical treatment which are most suit-

able for surgery. Still, it must be allowed that the likelihood of *complete* relief is greater with surgical than with medical measures. Partial thyroidectomy is the operation of election in all cases, but ligation of one or both superior thyroid arteries may be serviceable in some cases as a means of ascertaining the susceptibility of the patient to the larger operation. Even the most acute cases are apt to have periods, shorter or longer, of diminished thyroid intoxication, and the opportunity of such an interval may at times be taken to submit the patient to operation. Local anæsthesia is, on the whole, safest and best, but in the case of an extremely nervous and excitable patient general ether-anæsthesia by the open method must be substituted. At the Mayo clinic there has been not a single death among 278 consecutive operations for exophthalmic goitre.

Operations on the **cervical sympathetic**—either simple section, or partial resection, or com plete and bilateral resection of the whole nerve and its ganglia—offer no hope of cure. The exophthalmos has now and again been remarkably diminished, but at serious risk of permanent damage to the eye.

Myxœdema and Cretinism

Myxœdema, the singular disease to which much attention has of late years been directed, mainly through the observations of Gull and Ord, is dependent on a morbid condition of the thyroid body, and pathologically related to those cases of *sporadic cretinism* in which there is a congenital absence or loss of function of that gland.

Adult myxœdema was described by Sir William Gull as "a cretinoid state supervening in adult life in women." Ord and many other observers have investigated and fully described this affection, and have shown that it is not restricted to women, although they are far more frequently affected with it than men.

The mode of origin of the disease is obscure. The anatomical condition appears to be wasting or

degeneration of the thyroid gland. It may be much diminished in size, or it may be completely atrophied and converted into a fibroid mass. The presence of an enlarged thyroid is not, however, inconsistent with the manifestations of this disease, as, although enlarged in size, the gland may, functionally, have undergone degenerative changes. The chief symptoms and clinical features of this disease are the following: Great loss of muscular energy, so that the patient's movements become remarkably feeble and slow, and the gait unsteady; the speech also becomes slow and deliberate, and sometimes indistinct, and the tongue is thick and swollen; mental operations, too, are slow and flagging. The face has a peculiar and characteristic appearance. It is swollen and expressionless; the complexion has a waxy aspect, and there is a bright red spot on each cheek caused by dilatation of veins and capillaries; the alæ of the nose are thickened and the nose itself is flattened and spread out; the lips are thickened, swollen, and often cyanosed; the eyelids are also swollen, baggy, or puffy, and transparent, but on puncture no fluid exudes; the eyelashes and eyebrows often disappear, and the hair disappears also from the axillæ and pubes and in part from the head, so that the patient may be nearly bald. The body generally increases in size and weight, and the abdomen becomes protuberant. The hands are notably swollen, clumsy, and "spade-like," their backs are especially so, the fingers are thick and sensation is defective. The "œdema" is solid, and does not pit on pressure. There is further a peculiar swelling of the subcutaneous tissues in the supraclavicular regions. The skin is observed to be very dry and rough, and the patient rarely or never perspires. The circulation is languid, the pulse slow and feeble, and the heart-sounds are weak. The temperature is usually subnormal. Albuminuria is sometimes present.

The clinical study of this disease, and especially the success of the efforts that have been made

to deal with it therapeutically, have thrown much light on the functions of the thyroid body, and have raised, if we may use the expression, the physiological rank of that organ. It is clear from the results observed to follow disease of this gland, as well as from its removal in men and animals, as reported especially by Kocher of Berne and Horsley in England, that it elaborates, normally, some secretion which passes into the general circulation and exerts there an important influence in tissue metabolism.

We will now briefly consider, in historical sequence, the therapeutic measures that have been applied to the amelioration and cure of the myxœdematous state. At first the application of hot baths and keeping the body warm and well protected from chill, and promoting the action of the skin by the exhibition of jaborandi, was all that seemed clearly indicated; our latter-day enthusiasm for specific remedies has led to an unwise neglect of these simple adjuncts of treatment. Following this, most remarkable results were obtained by the adoption of a method of treatment which inaugurated a new departure in therapeutics, and which has been followed by many innovations in the same direction that have been attended with a variable degree of success. Remedial agencies, in the shape of drugs, had hitherto been looked for chiefly in the mineral and vegetable kingdoms; we had extracted the juices of many vegetable organisms, and applied them to the relief of human suffering and infirmity. We next turned to the animal organism to seek curative and preventive powers for certain morbid states in the juices of animal tissues and organs. The observation of the frequent occurrence of a peculiar morbid state (*cachexia strumipriva*), closely allied to cretinism and myxœdema, in persons and animals (monkeys) whose thyroid glands had been wholly or partially removed, and the knowledge of the fact that in cases of congenital or sporadic cretinism the thyroid gland is congenitally absent; and further, the discovery that

in cases of myxœdema the thyroid body is often found shrivelled and completely atrophied, led up to this remarkable therapeutic discovery.

The first attempts were made with **thyroid grafting.** This had been carried out with good results in *cachexia strumipriva*, in *sporadic cretinism*, and in *myxœdema*, by Kocher, Horsley, Bircher, and by Gibson, of Brisbane. In a case of sporadic cretinism fully reported by Gibson,* the grafting was done by removing both lobes of an ætherised lamb's thyroid, incising them longitudinally and introducing them (1) within the sheath of the pectoral muscle, and (2) on another occasion into the child's abdomen. The improvement in the child's condition which followed was most remarkable. Murray, of Newcastle, was one of the first to suggest and adopt the use of an **extract** of the **thyroid glands** of sheep, injected hypodermically, in the treatment of these conditions, and striking results were obtained.

It must be borne in mind that the too rapid introduction of the thyroid extract into the blood, or its introduction in too large quantity at a time, is unsafe, and is apt to be attended by unpleasant phenomena, collectively termed thyroidism, such as flushing, nausea, lumbar pains ; and even loss of consciousness and tonic muscular spasms have been induced. There is also another important caution to be kept in view, and that is that such patients must not be allowed to undergo exertion while under treatment, or to return too soon to their former mode of life, after their apparent cure, for in some the cardiac muscle remains very feeble, and sudden death from cardiac failure has occurred in some patients on making efforts to which they had long been unaccustomed. Of course this kind of treatment, which has for its object to supply the defective thyroid secretion, must in most cases be more or less continuous for the rest of the patient's life, and on its entire discontinuance re-

* *Brit. Med. Journ.*, Jan. 14, 1893.

lapses must be expected. But the hypodermic method of administering the fluid extract is now largely supplanted by the use of dry or liquid extracts, and especially of that made in the tabloid form.

It is best to commence the treatment with small doses. The appropriate dose for each patient must be gauged by observation of the effects of treatment. At first one of Burroughs & Wellcome's smaller tabloids (1½ grains) may be given to an adult once or twice a day. This dose should be gradually increased up to 6 grains daily. Then after a few days' interval a slowly progressing increase may be again adopted, provided no untoward symptoms are manifested. Three doses of 5 grains each per diem should be regarded as the maximum. In the case of child cretins these doses must be proportionately diminished. The occurrence of headache or pains in the muscles should at once be regarded as signals for diminishing the dose, and should more serious toxic symptoms appear the drug must be discontinued for eight or ten days, and the patient carefully watched. The treatment may then be resumed with quite small doses. It has been found that patients bear this treatment better when kept mainly on a suitable vegetable diet. A small dose of strychnine ($\frac{1}{30}$ to $\frac{1}{20}$ grain) three times a day is helpful in supporting the patient's strength during this treatment. After the full effect of the thyroid treatment has been obtained, the question arises as to the best method of continuing its use so as to avoid relapses. The best results seem to have been obtained by giving 10 or 12 grains three or four times a week for three or four weeks. Then the drug is for a time discontinued until some signs of a relapse appear, when small doses (3 grains thrice daily) for a week will generally suffice for their removal ; then return to the thrice-weekly dose, and so on. The exact dose that will keep symptoms in abeyance varies with each patient, but is readily

ascertained on trial. Murray considers that quicker results are obtained with the official liquor thyroidei.

Iodothyrin—a substance prepared from the iodo-albuminous material in the colloid substance of the thyroid gland, containing nearly 10 per cent. of iodine, mixed with sugar of milk, so that 15 grains of the powder is equal to about 15 grains of fresh gland—was introduced for the treatment of myxœdema and other affections. Meltzer found it serviceable in this disease.* He did not find it so active as the other preparations of the gland, but it had the advantage of being tolerated in large doses —30 grains a day for many weeks—without giving rise to any unpleasant symptoms. It is certain that iodothyrin represents only a part of the active substance of thyroid, but Meltzer considers there is some advantage in this—for, as it does not contain albuminous matter, it must be free from toxic ptomaines, and does not decompose even after months.

The fresh thyroid glands themselves have been given by the mouth in many cases, and thus taken they appear to be quite efficacious. Half a sheep's thyroid seems to be a suitable dose for an adult. It must be eaten raw, and may be minced fine and mixed with a little weak spirit and water, or wine and water, or syrup. Besides the tabloids of Messrs. Burroughs & Wellcome, each 5-grain tabloid being equivalent to $\frac{1}{12}$th of a lobe of the fresh thyroid gland of the sheep, there are many other preparations in use. Parke, Davis & Co.'s thyroid tablets represent respectively 5 grains and 10 grains of fresh thyroid gland of the sheep.

The results of this mode of treatment in myxœdema may be thus summarised: the swelling diminishes and the natural expression of the face returns, the skin peels off and the cutaneous surface loses its harshness and dryness, and becomes soft and moist, and the patient is able again to perspire freely. New hair

* Hare's "System of Practical Therapeutics" (new edit.), vol. i., p. 602.

grows on the head. After a brief period of feverishness the previous subnormal temperatures approach the normal. The hands and the rest of the body become smaller, and there is usually a great loss of weight. Mental as well as bodily activity is to a great extent restored. Increased diuresis is common.

In cases of sporadic cretinism the commencement of the treatment has been frequently marked by some febrile disturbance with mental excitement and restlessness; after a little time the œdematous infiltration of the tissues begins to subside rapidly, and in a few weeks disappears. The skin, as in myxœdema, peels and becomes soft and smooth, and the hair grows over bald areas. The child becomes more lively and intelligent, and there is a most remarkable growth of the skeleton (in one of Byrom Bramwell's cases the child grew $6\frac{1}{2}$ inches in six months).

ADDITIONAL FORMULÆ

For exophthalmic goitre

℞ Ferri carbonatis saccharati, gr. xx.
Quininæ sulphatis, gr. xxx.
Extracti et pulveris glycyrrhizæ, q.s.
Ut f. pil. xxx. Three to be taken daily after meals.
(*Benedikt.*)

For the same

℞ Pulveris ipecacuanhæ, gr. ss.
Pulveris foliorum digitalis, gr. $\frac{1}{3}$.
Extracti opii, gr. $\frac{1}{6}$.
M. f. pil. Four to six to be taken daily. (*Dieulafoy.*)

For exophthalmic goitre

℞ Tincturæ ferri acetatis ætheris, ʒj ad ʒij.
Potassii iodidi, ʒij.
Aquæ ad ℥vj.
M. f. mist. A teaspoonful three times a day; also frictions with iodine ointment.
(*Lentovsky.*)

Iron and bromide mixture for the same

℞ Ferri et ammonii citratis, gr. xl.
Sodii bromidi, gr. lxxx.
Spiritus ammoniæ aromatici, ʒij.
Aquæ ad ℥viij.
M. f. mist. Two tablespoonfuls twice a day.

PART III.—DISEASES OF THE ORGANS OF RESPIRATION

CHAPTER XXIII

TREATMENT OF ACUTE AND CHRONIC NASAL AND LARYNGEAL CATARRHS

ACUTE NASAL CATARRH or CORYZA: Causes—Predisposition—Micro-organisms—Chill — Dust — Symptoms — *Treatment*—(*a*) Prophylactic — Fresh Air — Vaccines — (*b*) Curative—Preparations of Opium and Morphine—Quinine—Aconite—Camphor — Inhalations — Sprays — Irrigations — Menthol — Adrenalin—Cocaine—Tonics.

CHRONIC NASAL CATARRH: Tonics—Vaccines—Astringent Injections — Alkaline Injections — *Ozæna* or *Atrophic Rhinitis*—Obscurity of its Nature and Cause—*Indications for Treatment*—Cleansing Douches—Antiseptic and Deodorising Paints—Sprays—Injections—Bougies—General Treatment.

ACUTE LARYNGEAL CATARRH: Causes resemble those of Acute Nasal Catarrh—*Treatment*—Codeia or Morphine—Alkaline Drinks or Mixtures—Counter-irritation—Hot Fomentations—Cold Compresses — Cocaine — Inhalation —Food—*Treatment* in Children — Warmth — Medicinal — Leeches — *Severe Dyspnœic Form*—Cold — Emetics—Cocaine Spray—Tracheotomy.

CHRONIC LARYNGEAL CATARRH: Causes — Symptoms — *Treatment* — Mineral Waters — Local Applications — Sprays — Massage—Climate.

Additional Formulæ.

ACUTE NASAL CATARRH, OR CORYZA

THE phenomena attending an attack of acute nasal catarrh, coryza, or "cold in the head" are so familiar as scarcely to need description. The disease is interesting and instructive, however, as a type of catarrhal affections generally, since the inflamed mucous membrane is, in this case, accessible to view.

The **causes** of acute nasal catarrh are the same as those of other catarrhal affections of the air-passages, viz. exposure to some local irritant, com-

monly of microbial character, coupled with chill of the surface of the body, often associated with rapid changes of temperature; but exposure to these exciting causes does not necessarily produce this disease, unless a predisposition "to take cold" exists in the individual. This constitutional predisposition is very marked in many persons, and not easily accounted for.

The tendency to catch cold is much increased by living in stuffy, overheated rooms, and by overloading the body with clothing, so that the mucous membranes and skin become hypersensitive to changes of temperature. Ill-health from any cause, by lowering resistance, produces a similar susceptibility.

Dust is another frequent cause, especially the foul dust of the streets blown about by a cold east wind.

In most instances this disease seems to be infectious, and will sometimes spread from one member through a whole family. The *Micrococcus catarrhalis* is perhaps the most frequent offender, but the *Bacillus septus*, *Bacillus influenzæ*, and Friedländer's bacillus are also found, though less frequently.

The physical changes which are observable in the nasal mucous membrane when affected by an acute catarrh are these: The membrane is more or less red and swollen, so much so, sometimes, as completely to block up the nasal passages; the swelling is due to dilatation and congestion of the blood-vessels and exudation into the tissue of the mucous membrane. At first the surface is dry, but soon the fluid exudation is so considerable that it flows away from the surface as a colourless, thin, saltish fluid, often very irritating to the orifices of the nose and the adjacent skin of the lips. Later the swelling and congestion diminish, and the discharge becomes thicker and less transparent from the presence of abundance of young cells.

The **symptoms** accompanying this condition are, first, a sense of dryness and stuffiness in the nose, with a great desire to blow the nose—to "clear it"—sometimes there is a tickling feeling with an irresistible tendency to sneeze; the feeling of dryness is

soon succeeded by the flow of fluid just described, which may become distressingly abundant.

There is usually a smarting, painful feeling about the forehead and eyes, due to the extension of the catarrhal inflammation to the conjunctivæ and the frontal sinuses; sometimes it extends to the fauces, and causes pain in swallowing, or into the larynx, and gives rise to an irritable cough, or along the Eustachian tube, causing some pain and noises in the ears, and slight temporary deafness. With some persons there is usually a certain amount of fever present, with quickened pulse, slight rise of temperature, thirst, high-coloured urine, chilliness, and aching of the limbs. With careful treatment this disease usually disappears in from three to eight days, but if neglected it may terminate in chronic catarrh, which may extend to the larynx, or even to the bronchial tubes.

The **treatment** of acute nasal catarrh may be conveniently considered under two heads—(*a*) prophylactic; (*b*) curative.

(*a*) **Prophylactic treatment.**—This should consist in the adoption of some hardening process which shall have for its object the removal or diminution of a certain hypersensitiveness of the skin and mucous membranes which characterises such patients.

Avoidance of stuffy, ill-ventilated rooms and sedentary habits, together with free exercise in the open air, is of great value. Cold affusion over the head and neck, begun in warm weather and steadily maintained throughout the whole year, is of undoubted efficacy.

One of the best prophylactic measures against attacks of nasal catarrh is residence in a dry, bracing locality.

Removal for a season to a dry, cold, mountain climate, where much of the day may be spent in the open air, is of especial value in lessening the morbid sensitiveness of the skin, so far as it tends to the production of catarrh of the respiratory tracts. Here, too, there will be less disposition to overload the body with warm clothing.

Next in value to mountain air is sea bathing, during the summer months, associated with abundant exposure to the open air of the seaside. Such patients should not be allowed to remain long in the sea at a time; it is better they should make repeated plunges, for it is the bracing shock to the surface that is required, not the continued contact with the cold sea-water.

We have said that those who are out of health from any cause are especially prone to catch cold, so that attention to the general health is an important matter in staving it off. Sometimes abnormal conditions of the nasal passages seem to predispose to colds, and will then require local treatment. If experience of previous colds in the patient has shown that they are habitually associated with the same causal organism, the corresponding **bacterial vaccine** may help to raise his resisting power.

(*b*) Of **general remedies** none is comparable in the rapidity and certainty of the cure with a few days spent in bed, or, if the patient must be up, in a warm, well-aired room.

Diaphoretic remedies are undoubtedly of great value at the outset. A hot mustard-and-water bath to the feet at bedtime, along with a basin of hot gruel, is a time-honoured and valuable remedy. Of diaphoretic drugs one of the most effectual is **opium.** It acts best when combined with other diaphoretics. If it fails to cure the cold, it at any rate relieves the most distressing symptoms.

It is by no means a matter of indifference what method of administering the opium is adopted.

When the cold is quite in its initial stage, when the nasal mucous membrane is only a little swollen and dry, and there is an uneasy feeling over the frontal sinuses, and before the occurrence of any great amount of fluxion, the following is perhaps the best method :

Supposing the patient to have had a good meal in the middle of the day, no more solid food should be taken that day, but about three or four hours before

bedtime a pill of $\frac{1}{8}$ grain of acetate or sulphate of morphine should be taken with a small cup of weak tea; and at bedtime another $\frac{1}{8}$ grain with a wineglassful of whisky and water, or instead of morphine we may prescribe 10 grains of Dover's powder at bedtime. A basin of hot gruel, to which a tablespoonful or two of whisky may be added, should be taken at the same time.

If the patient is feverish or troubled with rheumatic pains it is an excellent plan to combine 15 grains of salicin with the Dover's powder.

Overnight a mild mercurial, $\frac{1}{2}$–1 grain of calomel, and a saline aperient—such as a seidlitz powder in warm water, or a few ounces of warmed Apenta water—the following morning, are useful auxiliaries.

These measures alone will constantly arrest a cold in the head if adopted in the initial stage. If they fail, they fail probably from want of attention to small details. It makes all the difference whether this small dose of morphine be taken when the stomach is full or empty, whether it be absorbed into the blood in a few minutes, or be mixed with a mass of food and absorbed slowly. The result in the two cases is wholly different. In the first case you have a definite quantity of the remedy quickly absorbed into the blood; in the second, the remedy is slowly absorbed in indefinite quantity, and there is no reason why some of it should not pass out of the body in the residue of the food.

If the dry initial stage is passed, and the nasal fluxion is thoroughly established, with a distressing feeling of oppression and stuffiness about the nasal passages and frontal sinuses, the following diaphoretic draught, containing opium, is of great use:—

℞ Liquoris opii sedativi ... ... ♏x.
Vini ipecacuanhæ ... ... ♏v.
Salicini puri... ... ... gr. xv.
Liquoris ammonii acetatis... ... ... ʒiij.
Aquæ camphoræ ... ... ad ʒjss.

Misce, fiat haustus. To be taken at bedtime.

If the patient is able to remain in the house or, better still, in a moderately warm room for a day or two, a single dose of this kind will not infrequently remove all the catarrhal symptoms.

But even these small doses of morphine or opium * are not well borne by some persons; the use of these drugs, in some patients, is often followed by nausea, a furred tongue, dark-coloured urine, pale clay-coloured stools, and a feeling of general malaise. These are persons commonly known as "bilious." In such cases it is best to avoid opium altogether, and give other diaphoretics, such as 2 tablespoonfuls of the following mixture every four or five hours :—

℞ Spiritus ætheris nitrosi ... ... ℥iv.
Liquoris ammonii acetatis ... ... ʒij.
Salicini puri ... ... gr. xl.
Vini ipecacuanhæ ... ... ♏xl.
Aquæ camphoræ ... ... ad ʒviij.
Misce, fiat mistura.

This is also a useful mixture for young children, in doses varying from 2 teaspoonfuls to a tablespoonful.

A few doses of **aspirin** will often be comforting and help to induce sleep at night.

After the first twenty-four hours, or even sooner, it is often advantageous to give some **quinine**, especially when there are still feverishness and a feeling of depression. It is best given in an effervescing saline mixture as follows :—

℞ Potassii bicarbonatis ... ... } āā ʒj.
Sodii bicarbonatis ... ... }
Ammonii carbonatis ... ... ʒss.
Syrupi aurantii ... ... ʒss.
Aquæ ... ... ad ʒviij.
Misce, fiat mistura.

℞ Quininæ sulphatis ... ... gr. xij.
Pulveris acidi citrici ... ... ʒij.
Sacchari lactis ... ... ʒj.
Misce, divide in pulveres sex. One of the powders, dissolved in water and mixed with a sixth part of the mixture, to be taken three times a day.

* The equivalent quantity of *heroin hydrochloride* may be given.

In children and young people, when an attack of coryza is attended, as it often is, with decided feverishness, and particularly if the throat is involved and its mucous membrane is found red and swollen, great benefit will follow the administration of a few doses of **aconite.** Indeed, aconite will be found most valuable in all the ephemeral and symptomatic fevers of children—1 to 3 minims of the tincture of aconite (according to the age of the child).

Camphor is a popular remedy for coryza; a few drops of the spirit of camphor, on sugar, or taken in water, every half-hour, will in certain persons arrest a cold in the head, if taken in the initial stage; but it is not to be compared in efficacy with opium, morphia, or heroin given in the manner enjoined.

Lastly, we have to consider the action of **remedies applied locally.**

We have not infrequently aborted a cold starting with soreness of the soft palate, lower naso-pharynx, and upper pharynx, by spraying these parts through the mouth with warm 1–3,000 sublimate solution: lotions of this strength are far too irritating for use in the interior of the nose.

During the initial stage of dryness and heat of the nasal mucous membrane, inhalations of medicated steam are most soothing. One dram of Friar's balsam with the same quantity of chloroform in a pint of steaming water may be ordered: some prefer spirit of camphor, ½ dram, in the same quantity of water.

A common and popular method of attempting to cut short an attack of coryza is to inhale the vapours given off by a mixture of ammonia, carbolic acid, and rectified spirit:

℞ Liquoris ammoniæ fortis ... ... ʒj.
Spiritus vini rectificati ... ... ʒij.
Acidi carbolici ... ... ʒj.
Aquæ ... ... ʒij.
Misce.

This mixture is dropped upon some absorbent substance, and the vapour is inhaled by the nostrils.

The following is also an excellent inhalation (dry) in the earliest stage of nasal catarrh; it can be inhaled from the bottle in which it is contained:—

℞ Pinol ... ... ʒij.
Camphoræ ... ... gr. xl.
Liquoris ammoniæ fortis ... ... ʒj.
Spiritus rectificati ... ... ʒj.
Misce, fiat inhalatio.

The inhalation of the vapour of **menthol** often proves most useful in relieving a recent nasal catarrh.

When the secretion is profuse and the nostrils feel blocked up, benefit is often obtained by the application of a warm spray or douche of a weak solution of common salt or sodium bicarbonate (2 to 6 grains to the ounce), or Ems water, four or five times a day. StClair Thomson* recommends a compound nasal wash of 5 grains each of sodium bicarbonate, biborate, and chloride, and white sugar, dissolved in 3–4 ounces of warm water. The drugs may be kept handy for use, at any time, in tablet form.

Brushing the nasal mucous membrane when dry with glycerine and rose water has been found useful, and the application of an oily substance often proves very comforting; or lanolin containing 5 to 8 grains of menthol to the ounce may be applied.

Applications of cocaine and adrenalin, advised by some, are forbidden by others as pernicious and to be avoided on account of injurious after-effects.

The recurrent form of nasal catarrh will often yield to change of air—from the town to the seaside or the open country. After subsidence of an attack of acute coryza, there is apt to remain a good deal of general depression, which calls for tonic treatment.

Chronic Nasal Catarrh—Ozæna

Many chronic forms of nasal catarrh are associated with structural changes in the nasal passages, and are only amenable to special local surgical treatment, and,

* 'Diseases of the Nose and Throat." 1911.

therefore, do not concern us here. Other forms are perhaps better termed recurrent than chronic, and are associated with the tendency to attacks of acute coryza already referred to. These are best treated by change of air, by attention to the general health, and by tonics, of which arsenic, or arsenic with iron, is the best. We have alluded above to the occasional value of vaccine-therapy in preventing recurrence. Injections of hazeline diluted with an equal quantity of water are also useful in these recurrent forms, but lotions of the metallic astringents are unsuitable for the delicate nasal mucous membrane.

Dry inhalations of pinol, eucalyptol, turpentine, menthol, and iodine may all be tried with advantage in different cases. If there is a tendency to the formation of crusts of inspissated mucus in the nostrils, these should first be washed away by douching the nasal passages with warm solutions of sodium bicarbonate and common salt (2 to 5 grains of each to the ounce); the hazeline lotion should be applied subsequently.

Oily sprays applied by means of an oil atomiser are very useful. Liquid albolene and parolene may be employed as the basis of such sprays, and 10 grains of menthol or 10 minims of terebene to the ounce may be added.

StClair Thomson gives the following useful form:

℞	Chloretone	gr. xv.
	Camphoræ	gr. xl.
	Menthol	gr. xl.
	Ol. cinnamomi	♏viij.
	Paraffini liquidi	ʒiij.

To be used with an atomiser.

Hare* recommends as a stimulant inhalation:

℞	Ol. eucalypti	ʒj.
	Ol. picis liq.	ʒij.
	Albolene (liquid)	ʒj.

To be used with an atomiser.

* Hare's "System of Practical Therapeutics," 1911.

The most troublesome and serious form of chronic nasal catarrh is that known as **ozæna** or atrophic rhinitis, characterised by the peculiarly offensive fœtid odour of the discharge from the nose, and of the expired air.

The anatomical condition corresponding to this somewhat obscure malady is a wasted or atrophic condition of the tissues within the nose. It is not known, with certainty, how the atrophy is brought about, or what is its precise relation to the fœtor which characterises the disease. The fœtor would appear, however, to be dependent to a great extent on the scanty secretion of mucus, and its tendency to dry up into crusts which decompose within the nasal cavity. It has been suggested that the particular kind of putrescence that occurs in ozæna may be due to the action of some specific microbe.

The **treatment** of these cases is mostly symptomatic and palliative, rarely radical and curative. The first indication is to remove all the crusts of inspissated and decomposing mucus retained within the nasal cavities. This is often a difficult matter. The second indication is to prevent their formation or re-accumulation; and the third is to improve the general health so as to modify the morbid tendency.

The cleansing of the nasal cavities of the adherent crusts of mucus is usually effected by means of the nasal douche, which, when properly applied, allows the stream of cleansing lotion to flow in at one nostril and out at the other, making thus a complete circuit of the nasal passages. The fluid usually employed for this purpose is a warm solution of bicarbonate of sodium (1 per cent.), and a large quantity must be passed through the nose until all the crusts are removed; steaming the nose, or syringing it, or applying a probe covered with cotton-wool, may be used as auxiliary means for removing portions of dry mucus not detached by the douche. Sulphur-water with 2 per cent. of potassium chlorate; tar-water with

1 or 2 per cent. of sodium chloride; a weak solution of sodium salicylate, or of carbolic acid: these have all been used for irrigation of the nasal fossæ. Schnitzler used for this purpose a lotion made with 3 drams of ammonium chloride, 4 drams of sodium bicarbonate, and 10 drops of carbolic acid to a pint of distilled water.

This cleansing process should be applied twice or thrice daily. As soon as the nasal cavities are completely cleansed, antiseptic and deodorising substances are applied in the form either of paints or injections, or sprays, or bougies, or insufflations.

The following is a useful formula:—

℞	Thymol	gr. j.
	Menthol	gr. x.
	Eucalyptol	♏j.
	Paraffini liquidi	℥j.

To be applied with a spray, or camel-hair brush.

Schnitzler used as a paint, to be applied with a brush, zinc chloride 16 grains, glycerine and water, of each ½ ounce. Bamberger used iodine 5 grains, potassium iodide 45 grains, dissolved in glycerine 10 drams. Lowenstein employs aristol, 1 part dissolved in 10 parts of flexile collodion; or it may be used pure as an insufflation. He claims admirable results from its use. Rosenbach uses balsam of Peru; he paints the mucous membrane of the nose daily with it, and leaves in the nose, as deeply placed as possible, a pledget of cotton-wool soaked in it. These pledgets must be frequently changed. The addition of a little oil helps to prevent them adhering. Nasal bougies of iodoform, each containing ⅙ grain, are used by Schrœtter.

Numerous other applications have been employed: some, after anæsthetising the mucous membrane by the application of a 4 per cent. solution of cocaine, apply pure tincture of iodine.

Curetting and also electrical cauterisation of the diseased membrane have been recommended.

In cases where any diseased bone can be discovered, this must of course be removed, and, as such are likely to be syphilitic cases, appropriate general treatment must also be applied.

The general treatment must be determined by the individual character of each case. Some (scrofulous cases) will require cod-liver oil and the iodide of iron, others arsenic, others hypophosphite of lime, and all will need careful dieting and good air. Residence at the seaside is sometimes very beneficial.

Acute Laryngeal Catarrh

The remarks made with regard to the etiology of acute nasal catarrh, and with regard also to the prophylactic measures desirable to be taken by persons predisposed to that affection, apply with equal force to those who are prone to suffer from attacks of acute catarrh of the larynx.

The **treatment** appropriate to the acute attack in adults is also by no means dissimilar. In the early stage the advantage of small doses of opium, codeia, heroin, or morphine in allaying irritation and relieving the cough is most marked. It is well to combine them with small doses of ipecacuanha, as in the pharmacopœial lozenge of morphine and ipecacuanha, or, better still, of tartarised antimony. The administration of $\frac{1}{8}$ grain of acetate of morphia with $\frac{1}{12}$ grain of tartarised antimony every four or five hours, or 4 or 5 grains of the compound ipecacuanha powder every five or six hours, will usually relieve most of the distressing symptoms—the tickling cough, the soreness in the larynx itself, the difficulty in swallowing sometimes present, and the hoarseness or impairment of voice. We have likewise found lozenges of heroin ($\frac{1}{24}$ grain) and terpine hydrate ($2\frac{1}{2}$ grains) excellent for this purpose. Warm alkaline drinks are also of much value in thinning the tenacious adhesive mucus which often hangs about the glottis and upper part of the larynx, and is difficult of expulsion; for this purpose a third of a

tumblerful of Ems, or Bourboule, or Apollinaris water, to which a tablespoonful or two of hot milk may be added, should be drunk every two or three hours; or the following mixture answers equally well :—

℞ Sodii bicarbonatis ... ... ʒj.
Sodii chloridi ... ... gr. xxx.
Spiritus chloroformi ... ... ♏xxx.
Aquæ camphoræ ... ... ad ʒvj̄.
Misce, fiat mistura.

Of this mixture 2 tablespoonfuls should be taken every two or three hours with 2 tablespoonfuls of hot water or milk.

Some prefer ammonium chloride in 10-grain doses, instead of the sodium chloride in the above mixture, and 5 minims of vinum ipecacuanhæ, or 10 minims of vinum antimoniale, may be given with each dose if the cough remains hard and dry.

Counter-irritation and warmth in the shape of a small poultice of mustard and linseed, or a turpentine fomentation, applied over the larynx are of great service. Some, however, prefer ice-cold compresses, and these are most useful if applied at the very beginning of an attack. Small pieces of ice may be sucked simultaneously.

The following liniment is also of great service, when rubbed into the throat over and adjacent to the larynx :—

℞ Olei pini sylvestris ... ... ʒij.
Linimenti camphoræ compositi ... ... ʒiv.
Linimenti saponis ... ... ad ʒjss.
Misce, fiat linimentum.

If the bowels are confined and the tongue furred, a saline aperient will be useful; 2 or 3 drams of Carlsbad salts, or the same quantity of sodium sulphate, in half a glass of hot water, will be the best.

It is of the greatest importance to avoid all causes of further irritation. The patient should therefore be kept to the house, and in one uniform temperature,

All exercise of the voice should be forbidden, and the desire to cough should be so far as possible resisted.

The inhalation of the vapour of hot water containing a dram of compound tincture of benzoin to the pint, or warm alkaline sprays containing some ammonium chloride (5 to 10 grains to the ounce), are useful when the cough is hard and dry and when there is difficulty in softening the tenacious and scanty mucous secretion.

Schnitzler considered the following solution applied with a hand-spray to be the most efficacious of remedies :—

℞ Cocainæ hydrochloridi ... ... gr. iv.
Potassii chloratis ... ... gr. lxxv.
Aquæ laurocerasi ... ... ♏lxxv.
Essentiæ menthæ piperitæ... ... ... ♏iij.
Aquæ... ... ... ad ℥viij.
Misce, fiat solutio.

In severe attacks it is generally an advantage to diffuse the steam of hot water through the atmosphere of the patient's room by means of a bronchitis kettle, or by any other suitable means for keeping the air charged with vapour of hot water.

Direct local applications are rarely advisable in cases of acute catarrhal laryngitis, but they are of great service if the catarrhal condition persists and the case becomes chronic.

Generally there is marked disinclination to take food; warm liquid food is most acceptable, and sipping hot milk freely diluted with Vichy or Apollinaris water is comforting.

Acute laryngeal catarrh in adults is usually not a serious disease, but in a subacute form it often occurs with troublesome frequency in persons who have to use the voice much in singing or speaking, and it is then more difficult to treat, and tends to become chronic. Faulty use of the voice is often at the bottom of the trouble, and much may be done to relieve it by a skilled course of voice-training.

In **young children** acute laryngitis is often

a grave malady on account of the attacks of nocturnal dyspnœa which frequently accompany it. These attacks often assume a very alarming aspect, and are constantly mistaken for attacks of true croup, especially by anxious parents.

A young child becomes affected with what is apparently a mild catarrhal affection, attended with a little sneezing and coughing, but without any dyspnœa or other alarming symptom: but in the middle of the night it wakes up with an alarming attack of dyspnœa, accompanied with loud stridulous inspiration, a dry hacking cough, and hoarseness of voice. The dyspnœa is often intense, and is attended with great restlessness and anxiety. Careful inspection of the throat will satisfy you that the attack is not due to any membranous or diphtheritic exudation. The dyspnœa is due to the fact that the larynx and glottis in young children are small and imperfectly developed, and the catarrhal swelling of the mucous membrane, together, probably, with the accumulation during sleep of dry, tenacious mucus on the margins of the glottis, is sufficient to cause considerable laryngeal stenosis and inspiratory obstruction. In some cases spasmodic contraction of the laryngeal muscles no doubt contributes to the dyspnœa. As a rule, these attacks of dyspnœa pass off after a longer or shorter interval, and are unattended by danger; but the attacks have such a serious and alarming appearance, and the anxiety of the little patient's relatives is generally so great, that some active treatment is urgently demanded to allay their fears, and is usually rewarded with much apparent success.

It has been stated that attacks are caused by drying of the pharyngeal mucous membrane during sleep, and that the proper treatment at first is to give the infant warm drinks—a tablespoonful of warm lemonade or syrup—and to apply a hot sponge or compress to the throat, and to surround the child with the steam of hot water, or the child may be put bodily into a warm bath. In winter the air of the

child's bedroom should be kept moist with the vapour of water, and the infant should be kept awake for an hour or two, so as to lessen the risk of developing the exciting cause. Between the attacks we may prescribe a mixture containing 2 or 3 minims of antimonial or ipecacuanha wine, with the same quantity of tincture of squill in a teaspoonful of chloroform water. Some think highly of a few small and rapidly repeated doses of aconite.

If the child is a vigorous one, and there is turgescence of the vessels of the neck and face, no harm, and possibly some good, may be done by the application of a leech, or perhaps two, over the manubrium sterni. It is a proceeding which usually commends itself to the distressed parents, and it is a mistake to suppose that the abstraction of a small amount of blood in such cases can do any harm. The relief, indeed, so often afforded by this measure would seem to show that it does influence favourably the engorged or swollen or irritable laryngeal mucous membrane.

In cases in which there is constant irritative cough without any dyspnœa, from 1 to 6 grains of Dover's powder, according to the age of the child, should be mixed with a few grains of sugar of milk, and divided into six powders, and one of these given every hour or two until the cough is relieved. To promote expectoration when this is difficult, as is the case with most children, the following mixture is useful :—

℞ Sodii chloridi ... ... gr. xvj.
Sodii bicarbonatis ... ... gr. xxiv.
Syrupi senegæ ... ... ʒiv.
Aquæ... ... ... ad ʒiv.

Misce, fiat mistura. A dessertspoonful (warm) every two hours.

For the same purpose warm Bourboule water, to which a little glycerine is added, may be sprayed into the throat.

In more urgent conditions some think highly of **emetic** doses of ipecacuanha and tartarised antimony. Certainly $\frac{1}{4}$ to $\frac{1}{6}$ grain of tartarised antimony with 30

to 60 minims of ipecacuanha wine, mixed with 2 or 3 teaspoonfuls of warm water, will often cut such attacks short in a striking manner, probably by thinning the tenacious mucus adherent to the laryngeal mucous membrane.

After vomiting has been produced, it is well to keep up a slightly nauseating effect by small doses of ipecacuanha or antimonial wine every hour or two in some saline mixture; and the child's bowels should be acted upon with a grain or two of grey powder and a few grains of compound scammony powder.

If, however, there is œdema of the glottis, ice-cold compresses should be applied to the throat without delay, and we may be driven to spray the fauces from time to time with a 2 per cent. solution of cocaine. If the dyspnœa be so severe as to threaten life, tracheotomy should be promptly performed.

Attacks such as these are usually limited to childhood; but it does occasionally happen that **œdema of the glottis** suddenly sets in in the course of an acute laryngitis in the adult. Ice-cold compresses should be applied at once, and small pieces of ice may be constantly sucked. Food is best restricted at first to sipping ice-cold milk and soda-water. Some find it easier to swallow semi-solid food: then the milk may be made into a jelly with isinglass. In such cases, if the dyspnœa is alarming, no time should be lost, but recourse had speedily to tracheotomy. Happily, these cases in adults are very rare.

Chronic Laryngeal Catarrh

Repeated and neglected attacks of acute laryngeal catarrh lead to the establishment of a chronic catarrhal condition of the larynx, which is often tedious and difficult of cure. It is frequently brought on by overtaxing the vocal organs in public speaking, singing, etc., so that it is common to find this affection amongst clergymen, public singers, and actors. Sometimes it is a consequence of disorders of the nasal and post-nasal cavities.

It is also, in some cases, due to an extension of a catarrhal condition from the pharyngeal mucous membrane, as in drunkards and inveterate and immoderate consumers of tobacco. The hoarse voice of drunkards is well known. It also forms a part of the morbid changes which affect the larynx in phthisis and syphilis, and may be a local evidence of constitutional disorder, such as gout. We shall here only consider briefly the treatment of the simple form of chronic laryngeal catarrh characterised by three prominent symptoms—hoarseness, cough, and expectoration.

The **treatment** of this troublesome affection requires, first of all, the removal of the exciting cause, which will often be found far removed from the larynx. If the cause lie in the nose or naso-pharynx, the advice of a laryngologist must be sought. If it can be traced to the use of tobacco or alcohol, these must be forbidden. Faulty use of the voice may be greatly benefited by appropriate training in its use. Absolute rest of the organ must be insisted upon in the case of public speakers, actors, and singers, and the advantage they often derive from a few weeks' residence and treatment at such spas as Cauterets, Eaux Bonnes, or Mont Dore probably depends as much on the enforced repose and the healthiness of the outdoor life they lead there in pure, tonic air as on the use of the mineral waters of those springs.

Local applications are mainly to be relied upon in the treatment of this disease.

Various astringent remedies are employed for this purpose, and each physician usually has his favourite remedy. Our own preference is for the frequent application by means of a spray of weak astringent lotions, such as silver nitrate, 3 grains, or copper sulphate, 2–5 grains to the ounce, reserving any stronger applications to be made by the physician himself. Von Ziemssen extolled the use of strong solutions of nitrate of silver, 16 grains and upwards to the ounce, and they are, doubtless, amongst the most efficacious remedies: the good effect lasts much longer

than that of milder astringents, so that an application once a week or once a fortnight will suffice. Solis-Cohen also thinks highly of painting the vocal cords, in obstinate cases of chronic laryngitis in those who have to use the voice much, with solution of nitrate of silver. He applies a solution of 10 grains to the ounce daily for a few days, then at longer intervals, and finally he applies, once a week, a solution containing 40 to 60 grains to the ounce. Others prefer the chloride of zinc (20 grains to the ounce), others chloride of iron (20 grains to the ounce), alum (10 grains to the ounce), tannin (10 grains to the ounce), and so on.

When there is troublesome night cough a lozenge or pill, at bedtime, of heroin ($\frac{1}{24}$ grain) and terpine hydrate ($2\frac{1}{2}$ grains) will be found very useful. This dose may be repeated during the night if necessary.

In the intervals of, or as alternatives to, these applications, the use of cleansing alkaline *sprays* may be beneficial. Several suitable formulæ are given in the preceding section on Acute Nasal Catarrh (pp. 554-5). These may be applied with a hand-spray.

In cases where the mucous secretion is scanty and tenacious and difficult of removal from the mucous membrane and vocal cords, warm alkaline sprays are also of much value. It is often advisable to cleanse the mucous membrane first with a warm alkaline spray before using the astringent applications. Three or four ounces of Ems or Bourboule water, drunk with a little hot milk, night and morning, will also be found useful in promoting the solution and expulsion of dry, inspissated mucus. We have seen very great and permanent as well as immediate benefit result from the diligent use of warm Bourboule water, taken internally and applied locally to the larynx by means of a hand-spray, in subacute, irritable cases.

From the number of priests, singers, and actors with laryngeal catarrh found frequenting the springs of Mont Dore and La Bourboule, and also the sulphur springs of Eaux Bonnes and Cauterets in the Pyrenees,

we may conclude that they derive benefit from these waters, as well as from the course of life prescribed for them at those places.

Massage to the front and sides of the neck for two or three minutes at a time, the fingers of the operator being well covered with pomade, has been found very useful.

One of the most efficacious remedies in the treatment of chronic or recurrent laryngeal catarrh is change of climate. In some instances a change from a low-lying or damp inland district to the seaside, or to a more elevated and drier locality, is sufficient to bring about a cure, or very great amelioration. But in more obstinate cases, and when it is practicable, removal to a more equable and milder winter climate than can be met with in Great Britain is desirable; the winter climate of Madeira, the Canaries, and some of the islands of the West Indies, or a sea-voyage in southern seas, is perhaps best suited to the majority of cases. Some cases, however, do well in the drier climate of Egypt, especially persons who find themselves better in a dry and bracing atmosphere. High elevations are not suited, as a rule, to these cases, save in exceptional instances and in exceptionally fine seasons; the rapid changes of temperature, and the occasional occurrence of severe weather, with cold mists and heavy snowfalls, are apt to aggravate the catarrhal state of a sensitive larynx. Moderate elevations, however, such as that of Glion, or Cauterets, or Meran, often produce great benefit in these cases.

ADDITIONAL FORMULÆ

Mixture for acute laryngitis

℞ Liquoris morphinæ hydrochloridi, ♏ij.
Vini antimonialis, ♏ij.
Succus conii, ♏vj.
Liquoris ammonii acetatis, ♏ij.
Aquæ camphoræ ad ℥x.
M. f. mist. A tablespoonful every four hours. (*Whitla.*)

For acute laryngitis in children

℞ Apomorphinæ hydrochloridi, gr. ¼.
Acidi hydrochlorici diluti, guttæ iij.
Syrupi senegæ, ♏v.
Aquæ ad ♏jss.
M. f. mist. A teaspoonful every hour. (*Monti.*)

Mixture for acute suffocative laryngitis in children

After an Emetic

℞ Kermes mineralis, gr. ¾ to 1½.
Tincturæ aconiti, ♏v ad x.
Tincturæ belladonnæ, ♏v ad x.
Syrupi floris aurantii, ℥j.
Aquæ anisi ad ℥v.
M. f. mist. A dessertspoonful every hour or half-hour.
(*Simon.*)

An expectorant in catarrhal laryngitis in children

℞ Potassii iodidi, gr. xv ad xx.
Syrupi scnegæ, ℥iij.
Aquæ ad ℥iij.
M. f. mist. A dessertspoonful every two hours. (*Monti.*)

For the subacute laryngitis of vocalists

1. An aperient.
2. A laryngeal spray of 1 per cent. solution of cocaine.
3. The following lozenges—

℞ Morphinæ bimeconatis, gr. $\frac{1}{100}$.
Cocainæ hydrochloridi, gr. $\frac{1}{125}$.
Tincturæ aconiti, ♏ $\frac{1}{6}$.
Radicis althææ pulveris, gr. ss.
in each; one to be taken frequently.

4. As a preparation for a vocal effort after acute symptoms have subsided, $\frac{1}{60}$ grain of strychnine after breakfast and lunch, and $\frac{1}{30}$ grain after dinner.
(*Faulkner.*)

Sedative spray or gargle in laryngitis

℞ Cocainæ hydrochloridi, gr. viij.
Glycerini acidi carbolici, ℥ij.
Aquæ rosæ ad ℥viij.
M. To be used occasionally as a gargle, and frequently as a spray. (*Whitla.*)

Tablets for acute coryza

℞ Morphinæ, gr. $\frac{1}{12}$.
Atropinæ, gr. $\frac{1}{600}$.
Caffeinæ, gr. ⅛.
M. (*S. S. Bishop.*)

For atrophic rhinitis

Formalin in aqueous solutions, 1 in 1,000 to 2,000.

To be injected with nasal syringe. (*Bronner.*)

For laryngismus stridulus

℞ Potassii bromidi, ℥ij.
Chloral hydratis, ℥ss.
Syrupi tolutani, ℥iv.
Aquæ ad ℥ij.
M. f. mist. A teaspoonful every half-hour for a child 2 years old.

Inhalation in acute catarrhal laryngitis to relieve heat and tickling in the throat

℞ Aquæ laurocerasi, ℥jss.
Spiritus vini rectificati ad ℥iij.
M. A dessert- or table-spoonful to be inhaled night and morning. (*Schrœtter.*)

Inhalation or spray in chronic catarrhal laryngitis

℞ Acidi tannici, gr. xv.
Spiritus vini rectificati, ℥ijss.
Aquæ ad ℥ij.
M. (*Schrœtter.*)

Inhalation for subacute laryngitis

℞ Olei pini sylvestris, ℥ij ad ℥iij.
Magnesii carbonatis levis, ℥j ad ℥jss.
Aquæ ad ℥iij.
A teaspoonful to be added to a pint of water at 150° F. and inhaled for five minutes two or three times a day. (*Mackenzie.*)

Treatment of chronic catarrhal laryngitis

1. Drink infusion of pine cones (1½ drams to a pint of water).

2. A glass of sulphur water in the morning (Eaux Bonnes, Cauterets, or Enghien).

3. Inhale tar vapour.

4. Apply to the larynx the following solution:—

℞ Zinci chloridi, gr. xv.
Aquæ destillatæ, ℥j.

M. f. solut.
(*Nouveaux Remèdes.*)

For acute laryngitis in adults

℞ Sodii salicylatis, gr. x ad xx.
Phenazoni, gr. v.
Spt. ammon. arom., ♏xv.
Elixir rubri, ♏xv ad l.
Aq. cinnamomi ad ℥j.

Ft. haustus. To be given for relief of soreness.
(*St Clair Thomson.*)

Gargle for hoarseness from fatigue of voice

℞ Acidi tannici, ʒj.
Glycerini boracis, ʒij.
Tincturæ capsici, ʒjss.
Infusi rosæ acidi ad ℥x.

M. f. gargar. To be used frequently. (*Whitla.*)

Snuff in chronic rhinitis

℞ Cocainæ hydrochlor., gr. 2¼.
Camphoræ, gr. 1½.
Aluminis, gr. 1½.
Menthol, gr. ¾.
Sacchari pulv., ʒjss.

M. f. pulv. (*Maraval.*)

Application for deep ulcerations in ozæna

℞ Aristol } āā gr. 150.
Ol. ricini }
Collodion, gr. 1,200.

M. To be applied on pledgets of cotton-wool. (*Foxino.*)

Ointment for ozæna

℞ Ichthyol, ʒj.
Coumarini, gr. ij.
Ung. paraffini, ʒv.

A small piece to be placed within the nostrils, and snuffed up. (*St Clair Thomson.*)

CHAPTER XXIV

TREATMENT OF ACUTE BRONCHIAL CATARRH

Prophylactic Measures — Vaccination — *Treatment* of Different Forms—*Mild Forms*—The Room—The Bed—The Clothing—Alkaline Waters — Diaphoretics — Tartarised Antimony — Opium: need of Caution in its Use—Aconite—Poultices—Antiphlogistine — Aperients — Alkaline Expectorants — *Graver Forms*—Indications for Treatment—Position in Bed—Leeches —Dry-cupping—Blood-letting—Counter-irritation—Poultices —Tartarised Antimony—Stimulating Diaphoretic Drinks—Aperients — Dangers of Opium — Inhalations — Alkaline Sprays — Carbolic Acid Spray — Ipecacuanha and other Expectorants — Squill — Senega — Ammonia — Stimulants and Tonics—Potassium Iodide and Ammonium Chloride —Emetics—Oxygen Inhalation in Capillary Bronchitis of Children—Quinine and Arsenic in Febrile Cases—Alcohol—Ether—Digitalis — Strychnine—Lobelia—Chloroform Inhalation—Diet—Convalescence—Additional Formulæ.

In considering the management of cases of bronchial catarrh, we shall first call attention to **prophylactic** measures.

Young children with a tendency to such attacks should be carefully guarded against exposure to chill, and to rapid and great changes of temperature; at the same time every opportunity should be taken to brace and harden them so as to diminish the morbid sensitiveness of surface upon which the liability to catarrhal attacks depends. In the warm season cold affusion or sponging should be cautiously practised, together with vigorous friction of the skin.

Abundant exercise in the open air, the child being warmly and suitably clad, with flannel next the skin, is of use also. But undue exposure on raw, cold, windy days must be especially guarded against, particularly with very young children.

The general nutrition of young children with this predisposition must also be looked to, especially if there is any tendency to scrofula or rickets. In such

cases the tonic influence of the phosphates of lime and iron and cod-liver oil is particularly noticeable.

With old people having a tendency to this malady great caution is necessary in protecting them from exposure to changes of temperature, to draughts, to cold damp air, and they should not reside in cold damp localities. They should pass the winter, when possible, in a warm, equable, sunny climate, or, if this is not possible, be content during the bad weather of the British winter and spring to remain in a set of rooms kept at a uniform temperature.

In addition to these predisposing causes, micro-organisms are actively present in nearly all cases of acute bronchitis, and in those who are subject to repeated recurrences it will be wise to consider the propriety of vaccination, if a causal organism is isolated from the expectoration. The micrococcus catarrhalis, the pneumococcus, the bacillus of influenza, and other organisms have all been identified in this association.

The **treatment** of acute bronchial catarrh will necessarily depend on the particular form of the malady with which we may have to deal. It may, and often does, occur as a comparatively slight malady, unattended with any risk or danger if ordinary care and caution in its management be adopted. On the other hand, it also often occurs as one of the most serious and dangerous maladies we encounter, frequently fatal, and taxing all our skill in its treatment. Much of its seriousness depends on the age and vigour of the patient attacked, on the extent of the bronchial surface involved, and on the complications that may attend it. An attack of acute bronchial catarrh may be limited entirely to the trachea and larger divisions of the bronchi, and show no disposition to spread beyond them. These are the slight cases, but an attack of acute bronchial catarrh may also be diffused over a wide extent of the bronchial surface, and extend even to the finest ramifications of the bronchial tubes. These cases of capillary bronchitis are of the gravest

import. Such attacks prove very fatal to children and to feeble and aged persons, and are of great gravity even when affecting robust adults.

In the first place we shall consider the treatment appropriate to a **mild** case of acute bronchial catarrh in a previously healthy adult, and limited to the larger bronchi. Such an attack will usually be attended with a slight degree of fever; there will be more or less cough, usually at first dry and painful, attended with a feeling of soreness or rawness referred to the upper sternal region. Dry rhonchal and sibilant râles will be heard over both sides of the chest, loudest over the upper part. Usually there is but little dyspnœa, unless the attack be complicated with some spasmodic asthma.

The patient should be kept in bed in a well-ventilated room, the temperature of which should at no part be lower than 65° F. nor higher than 70° F. If the mucous membrane is sore and irritable the air of the room should be kept moist and unirritating by causing the steam of hot water, by means of a bronchitis kettle, to be freely diffused through the apartment. The bed-clothing should be warm but light, and soft woollen or flannel night-clothing should be worn. Warm mucilaginous or slightly alkaline drinks should be given freely, and varied according to the taste of the patient—viz. barley-water, linseed tea, thin gruel; but many patients prefer a mixture of hot milk and seltzer, or Apollinaris, or soda water. These alkaline drinks have a beneficial influence on the secretion from the inflamed mucous membrane; they diminish its tenacity, and so promote expectoration, and in this way relieve the cough. The addition of 2 to 4 teaspoonfuls of cognac, whisky, or rum to 3 to 6 ounces of hot milk and Apollinaris or seltzer water makes an excellent soothing expectorant drink.

But there is no remedy which relieves the distressing dryness of the mucous membrane in the early stage of acute bronchial catarrh so completely as

tartarised antimony. Quite small doses of this drug, combined with small doses of morphia, codeia, or heroin, will be found most efficacious in relieving these slight attacks of acute bronchial catarrh. We prefer heroin greatly to apomorphia, and think it a safer drug to handle. The opiate relieves the irritating cough by lessening the sensitiveness of the bronchial mucous membrane, and the antimony greatly increases the secretion from it, and so relieves the dryness and swelling which accompany the first stage of bronchial catarrh. Or a draught containing 5 to 10 grains of Dover's powder, 1 dram of spiritus ætheris nitrosi, 3 drams of liquor ammonii acetatis, and 1½ ounces of camphor water, at bedtime, and a saline aperient the morning following, is an excellent remedy to start with in mild forms.

When there is much fever and the patient is young, a few doses of aconite will be found useful at the commencement of the treatment. When there is not much fever, and the chief object is to relieve the cough and the dryness and soreness of the mucous membrane by promoting expectoration, this mixture may be given to adults :—

℞	Vini antimonialis	℥jss.
	Liquoris morphinæ acetatis	℥ss.
	Liquoris ammonii acetatis	℥jss.
	Aquæ laurocerasi	℥ij.
	Syrupi	℥iij.
	Aquæ	ad ℥vj.

Misce, fiat mistura. Two tablespoonfuls every three or four hours.

It should be given less frequently as the symptoms are relieved. In the case of persons who do not bear morphine well, codeine may be used in its place in the dose of $\frac{1}{6}$ or $\frac{1}{4}$ grain.

It must be remembered that old persons, and many persons with weak hearts, or with chronic respiratory difficulty, or with renal disease, bear opiates badly, and their use should be avoided in such cases.

If there is much fever, the following is useful :—

℞ Tincturæ aconiti ... ... ♏xxiv.
Vini antimonialis ... ... ʒij.
Liquoris morphinæ acetatis ... ... ♏xl.
Liquoris ammonii acetatis ... ... ʒjss.
Aquæ camphoræ ... ... ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls every four or five hours, or more frequently if the cough is very troublesome.

If for young children the morphine should be omitted, and ½ ounce of syrup of tolu added. The dose would be 1 or 2 teaspoonfuls, according to the child's age.

Much relief is also given by a hot poultice of linseed and mustard, applied over the top of the chest in front, and also behind between the scapulæ. On removal of the poultice, the chest should be covered with a cotton-wool jacket.

Antiphlogistine applications find favour with some physicians, so as to avoid the necessity of frequent change of poultices.

An aperient is often necessary and useful. One or two grains of extract of aloes with 1 grain of powdered ipecacuanha in a pill at bedtime, and the following morning two teaspoonfuls of Carlsbad salts in half a tumblerful of hot water, will be found an effectual purge, and if the tongue is thickly coated, and the urine high-coloured, ⅛ grain of calomel may be added to the pill.

With this treatment, in those milder forms the acute stage will rarely last more than a day or two, and the white, scanty, frothy, sticky expectoration of the first stage will be replaced by a more abundant, muco-purulent secretion. This change in the character of the secretion is an indication that the attack is passing off. It is now desirable to discontinue the antimony and the morphine, or to give them only at night for the relief of cough. It should be borne in mind that remedies like opium, antimony, and aconite are only given to relieve definite symptoms, and when

those are relieved **these drugs should be at once discontinued.**

An alkaline, mildly stimulating expectorant is now useful, such as the following:—

℞ Infusi senegæ ... ... ℥iij.
Sodii bicarbonatis... ... ... ʒj.
Sodii chloridi ... ... } āā gr. xxiv.
Ammonii carbonatis ... ... }
Syrupi tolutani ... ... ʒiij.
Aquæ ... ... ad ʒvj.
Misce, fiat mistura. Two tablespoonfuls every six hours.

A pill of 1½ grains of quinine, with ¼ or ½ grain of powdered ipecacuanha, may at the same time be given twice or three times a day, to promote convalescence.

A tablespoonful of brandy or whisky in a teacupful of hot milk and water, two or three times a day, is an excellent expectorant.

With this method of treatment patients may usually be carried safely through the commoner and slighter forms of acute bronchial catarrh.

Next as to the treatment most appropriate to the **graver** forms of **acute bronchitis:** to those cases in which the catarrhal inflammation is diffused over a great extent of the bronchial mucous membrane, and affects not only the larger tubes, but those also of medium size, and sometimes even the smaller ramifications.

Such cases, when they occur, even in vigorous adults, are very grave, and require most careful management; but when they occur, as they often do, in young and delicate children or in old and feeble persons, they are very serious indeed.

When the finer bronchial tubes become attacked, and their calibre is diminished by the inflammatory swelling of their lining membrane, and when many of them become blocked up by the accumulation in them of viscid secretion, it can readily be understood how imminent must be the danger of death by apnœa.

The objects we should keep in view in the treatment of such cases are these: (*a*) To diminish the

inflammatory hyperæmia and swelling of the bronchial mucous membrane. (*b*) To thin and liquefy the catarrhal secretion when it is dry and scanty. (*c*) To lessen it when excessive. (*d*) To promote its expulsion from the air-passages, and so obviate their obstruction. (*e*) To allay excessive sensibility of the bronchial mucous membrane. (*f*) To maintain and promote the circulation in the lungs, and prevent pulmonary engorgement and distension of the right side of the heart. (*g*) To reduce fever and maintain the general strength.

The several details of treatment by which these indications may be carried out will have to be modified and adapted to individual cases.

Much will necessarily depend on the age and vigour of the patient, as well as on the stage which the disease has reached when it first comes under treatment. Remedies most appropriate in the earliest stage, and in a young and vigorous adult, might be altogether unsuited to more advanced stages, to a young child, or to an old and feeble person.

We will first consider the treatment of a severe attack of acute bronchitis in *a young and robust adult*, seen at its onset. The air of the apartment must be kept warm and moist, as already pointed out.

The patient's position in bed should be arranged so as to counteract the tendency to passive or hypostatic congestions. He should therefore be raised almost to the sitting position, and should not be allowed to rest long on one side. This position will greatly assist expectoration.

If there is much oppression of breathing referred to the upper part of the sternum, half a dozen leeches applied over the manubrium sterni will be a judicious measure, and with this may be associated dry-cupping over the back of the chest and in the interscapular regions.

General bleeding is rarely necessary; it may, however, be had recourse to in certain very acute cases,

when the dyspnœa is extreme, the surface livid, and the danger of death from apnœa imminent. The removal of a few (6 or 8) ounces of blood will relieve the engorgement of the right side of the heart, and, at the same time, the pulmonary venous congestion. But venesection is never desirable in children, nor in old or debilitated persons.

In most cases it will be advisable to apply large linseed and mustard poultices over the front and back of the chest; and when the skin is too tender to allow of further counter-irritation, the chest may be enveloped in warm cotton-wool.

Poultices probably act by dilating the vessels of the surface, and so reducing blood-pressure in the veins and the right side of the heart, whilst by their heat they act as a cardiac stimulant.

We do not think any form of counter-irritation acts better than the linseed and mustard poultice when well made and carefully applied. But it is sometimes made badly, and applied carelessly so that it is not very unusual to find a poultice around the patient's loins instead of his chest!

We would call special attention to the importance of applying these moist poultices carefully, neatly, and accurately. We occasionally see patients in a state of great discomfort from the untidy application of moist cloths and poultices to the chest, which soon lose their warmth and become a source of danger as well as discomfort. It is better to apply hot, dry flannels sprinkled with turpentine than unskilfully made poultices, or to rub the chest with the linimentum terebinthinæ aceticum. Indeed, we think the application of the moist poultice is often overdone, and continued too long. After a time it is better to replace it with a simple layer or two of warm cotton-wool sprinkled with a little turpentine or pine oil, especially when the patient complains of discomfort from the moist application.

Of internal remedies, we are quite of Stokes's opinion that "there is no remedy that possesses such

a decided power over acute bronchitis" as **tartarised antimony**; but its success depends much on its early administration, i.e. when the bronchial mucous membrane is dry and tumid, before secretion has become abundant, and when the skin is hot and dry and the pulse hard and frequent. It should be given in quite small repeated doses, combined with other diaphoretics, viz. 10 to 20 minims of the antimonial wine for adults, and 5 to 10 minims for children. In these small doses it often produces less nausea than ordinary doses of ipecacuanha.

℞	Vini antimonialis	ʒij.
	Spiritus ætheris nitrosi	ʒiv.
	Liquoris ammonii acetatis	ʒij.
	Tincturæ camphoræ compositæ	ʒij.
	Aquæ	ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls every three or four hours with a tablespoonful of hot water.

Warm weak alcoholic drinks are needed to keep up the force of the circulation, while, at the same time, they favour diaphoresis, reduce fever, and promote expectoration. Two or three ounces of hot milk, with an equal quantity of seltzer or Apollinaris water and a dessertspoonful of brandy or whisky, should be given every three or four hours.

The advantage of procuring profuse diaphoresis is undoubted; whether it acts by derivation from the bronchial mucous membrane, or in some other way, it is certain that it is constantly attended with marked relief to the catarrhal symptoms.

Free evacuation of the bowels (the bed-pan, of course, must be used) should be regularly obtained, so as to favour the descent of the diaphragm and afford as complete expansion of the lungs in breathing as possible; while by unloading the portal system of veins, any tendency to distension of the right side of the heart is to that extent relieved. For adults it is as well to give at bedtime occasionally ½ grain of blue pill with a grain or two of the watery extract of aloes, and a teaspoonful of

Carlsbad salts, dissolved in hot water, the following morning. In the case of children, ¼ grain of calomel or ½ grain of grey powder may be given with 2 to 5 grains of compound scammony powder.

It is necessary to insist strongly on the importance of using the greatest discretion in the administration of opium in these cases of severe diffused acute bronchial catarrh. The more diffused the catarrh the more cautious must we be in the administration of opium. In old people and in young children opium is scarcely ever admissible, and even in adults, where there is much obstruction to the entrance of air into the lungs from the abundance of secretion in the air-passages, opium is a very dangerous drug.

The effect of opium is to check cough and diminish secretion; the former it does partly by lessening the sensitiveness of the bronchial membrane, and the latter by modifying the capillary circulation in it. But in cases of "suffocative" bronchitis, while we might desire to diminish the secretion, we dare not deaden the sensitiveness of the bronchial mucous membrane, or do anything to check the cough. So long as the air-passages are obstructed by catarrhal exudation we depend upon the cough to clear them and set them free, and we only desire to make it more efficient to that end.

It is extremely important to bear this in mind in connection with the use of opium in bronchial catarrh; a dose of opium given injudiciously may produce a fatal somnolency, and, by quieting the cough, lead to fatal blocking up of the air-passages.

If you give opium at all in such cases, give it in very small doses, and only when the patient is watched by some thoroughly trustworthy person; but never give it at night to procure sleep, however trying the cough may be, or however urgent the patient or the attendants may be for a sedative.

Remember that opium is very rarely admissible in the diffuse bronchial catarrhs of old persons and young children. When it is very necessary to secure

a few hours' sleep, it is better to give from 5 to 15 grains of trional, with an equal quantity of bromide of sodium, or 6 or 7 grains of veronal; and then the patient must not be allowed to sleep more than two or three hours at a time, unless the respirations are free and regular, for the secretions tend to accumulate in the bronchi during sleep, and hinder the access of air to the air cells. It is often necessary to give the patient on waking from sleep some diffusible stimulant to aid him to expel the mucus which has accumulated in the air-passages. A little brandy with hot milk and seltzer water is best for this purpose.

An agreeable and useful atmosphere for the patient to inhale is produced by dropping twenty or thirty drops of pinol on to the water in a bronchitis kettle; the vapour of the pinol is thus diffused through the room together with the hot aqueous vapour given off by the water in the kettle.

In the acute bronchial catarrhs of children, especially those accompanying infective diseases, such as measles and pertussis, we have found the frequent inhalation of a warm spray containing bicarbonate of soda and glycerine of carbolic acid of the greatest service in promoting expectoration.

We use the following proportions :—

℞ Sodii bicarbonatis ... ... gr. x.
Glycerini acidi carbolici ... ... ℥j.
Aquæ destillatæ ... ... ℥j.
Misce. To be used warm.

By means of a Seigle's steam-spray producer the spray should be allowed to play freely before the child's mouth and nose, so that he must inhale it with the inspired air.

As soon as the first stage is over, and the scanty and tenacious glairy secretion has been replaced by an abundant muco-purulent one, we must discontinue the use of tartarised antimony, or replace it by small doses of ipecacuanha; and now is the appropriate period for the administration of the stimulating

expectorants, such as squill and senega, in combination with carbonate of ammonia.

Spirit of chloroform is also an excellent expectorant, and at the same time it soothes and allays the cough.

A suitable formula is the following:—

℞ Infusi senegæ	... ...	ʒiv.
Ammonii carbonatis	... ...	gr. xxxij.
Tincturæ scillæ	... ...	♏lxxx.
Spiritus chloroformi	... ...	ʒij.
Aquæ	...	ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls every four or five hours.

If the cough remains troublesome, it may be advantageous to add to each dose of the above mixture 5 minims of wine of ipecacuanha and 20 minims of compound tincture of camphor.

On the other hand, as convalescence advances, the tincture of squill in the above mixture should be replaced by 1-dram doses of tincture of cinchona.

In all such cases symptoms of debility and loss of power must be immediately encountered by the administration of alcoholic stimulants.

In debilitated persons, and when we do not encounter the case in its earliest stage, a combination of carbonate of ammonia, ipecacuanha (in small doses), and bark, as in the subjoined formula, with warm stimulating drinks, and the inhalation of warm alkaline sprays to thin the secretions—these are the measures to be relied upon.

℞ Ammonii carbonatis	... ...	gr. xl.
Vini ipecacuanhæ	... ...	♏xl.
Tincturæ cinchonæ	... ...	ʒiv.
Aquæ chloroformi	... ...	ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls every four hours.

In somewhat advanced cases, especially in the rheumatic or gouty, when the expectoration is tenacious, scanty, and difficult of expulsion, potassium iodide is a most valuable remedy: it may be com-

bined with sodium chloride, as in the following formula :—

℞ Potassii iodidi ... ... gr. xl.
Sodii chloridi ... ... gr. lxxx.
Ammonii carbonatis ... ... } āā gr. xl.
Sodii bicarbonatis... ... ... }
Tincturæ senegæ ... ... ℥iv.
Aquæ chloroformi... ... ... ad ℥viij.

Misce, fiat mistura. Two tablespoonfuls, with one of hot water, three or four times a day.

In the case of young children who cannot expectorate, we must give occasional **emetics.** Ipecacuanha is the best. Twenty grains of powder of ipecacuanha mixed with a tablespoonful of syrup and water will usually have the desired result. The effect of the emetic is not only to promote expectoration, but by the mechanical compression of the lung it induces it tends also to relieve congestion. The sticky mucus which accumulates in the child's mouth after vomiting should be carefully removed.

Some prefer the hydrochloride of apomorphia as an emetic in these cases. One-twentieth of a grain injected hypodermically can usually be relied upon to produce vomiting in ten minutes. When a child cannot be induced to swallow an emetic, this is obviously a valuable alternative; the objection to its use is that it sometimes produces great depression.

Emetics are also useful in cases other than those of children when, owing to debility of the bronchial muscles, the catarrhal secretions are retained in the air-passages. This state "may be detected when, immediately after the act of coughing, the râles, instead of subsiding for a time, persist with scarcely any diminution. In such an emergency, should the expectorants fail, an emetic is imperatively indicated" (Niemeyer). Ipecacuanha or zinc sulphate should be used.

In order to ward off the danger of pulmonary collapse in young children, the child may be roused to more active respiratory efforts by putting him into a

hot bath, and sprinkling cold water on the chest while in it. Nor should he be allowed to fall into a prolonged or deep sleep, but should be aroused from time to time, and some stimulant given.

The **inhalation of warmed oxygen** has been found of remarkable value in some cases of capillary bronchitis in infants after all other means have failed. It has rapidly relieved the dyspnœa and the cyanosis, and led to ultimate recovery.

In cases in which there is a tendency to the maintenance or recurrence of fever, quinine must be given, or, if this is not well tolerated, arsenic. The latter drug may be given in combination with nux vomica, ammonia, and cinchona, as follows :—

℞ Liquoris arsenicalis... ... ... ♏xxiv.
Tincturæ cinchonæ compositæ ... ... ℥j.
Tincturæ nucis vomicæ ... ... ℥j.
Ammonii carbonatis ... ... gr. xxij.
Aquæ chloroformi ... ... ad ℥viij.

Misce, fiat mistura. Two tablespoonfuls three times a day.

Quinine may be given in combination with expectorants, as in the following prescription :—

℞ Tincturæ senegæ ... ... ℥iv.
Tincturæ nucis vomicæ ... ... ℥j.
Spiritus chloroformi ... ... ℥ij.
Tincturæ quininæ ammoniatæ ... ad ℥iij.

Misce, fiat mistura. Two teaspoonfuls in a wineglass of water three times a day.

In aged patients, and especially when acute bronchitis is accompanied by old emphysema of the lungs, together with dilatation of the right side of the heart, there is often difficulty in promoting expectoration and in maintaining cardiac action. In such cases we must give stimulants freely—a tablespoonful of brandy or whisky, with a little hot milk and seltzer or Apollinaris water, every hour ; or in some cases champagne may be given if the patient prefers it.

A mixture of ether, ammonia, and digitalis may be of use to stimulate the failing cardiac power :—

℞ Tincturæ digitalis ... ... ℥lxxx.
Spiritus ætheris ... ... ʒiv.
Ammonii carbonatis... ... ... gr. xl.
Aquæ ... ... ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls every two or three hours while necessary.

Or the action of the heart may be maintained by hypodermic injections of strychnine, and the dyspnœa relieved by oxygen inhalations—the oxygen being passed through a wash-bottle containing alcohol and standing in warm water. Strychnine acts powerfully on the respiratory centre, and its administration is an invaluable expedient in the later exhaustive stages of acute bronchitis.

Spasmodic dyspnœa, with dry râles, may require the administration of the ethereal tincture of lobelia. This may be given combined with ammonia and small doses of morphine, with due regard to the caution we have already given concerning the use of the latter drug.

℞ Tincturæ lobeliæ ætheriæ ... ... ʒj.
Ammonii carbonatis ... ... ʒss.
Liquoris morphinæ hydrochloridi ... ʒj.
Aquæ ... ... ad ʒvj.

Misce, fiat mistura. One tablespoonful every hour or two until relieved.

The inhalation of a few drops of chloroform may sometimes be necessary to relieve spasmodic dyspnœa. If the dyspnœa is caused or aggravated by intestinal flatulence, and if this has arisen from an unwise disinclination to keep the bowels relieved by aperients—the desirability of which we have repeatedly insisted upon—then we may administer a turpentine or rue enema, or give the following pills and draught: 4 grains of the compound rhubarb pill with 4 grains of the aloes and asafœtida pill, followed by a draught containing 2 drams of sulphate of soda, 3 drams of tincture of senna, and 1½ ounces of caraway water.

The **diet** during an attack of acute bronchitis of any severity should be fluid in the main. Milk when it is well borne and easily digested is excellent—it should usually be given warm, or diluted with hot water. Nourishing soups, gruels, and broths which favour diaphoresis should also be given. Beaten-up eggs, the yolks of lightly boiled or poached eggs, and custard pudding, are all useful. Light puddings, tapioca, ground-rice, or arrowroot, are permissible, and if the tongue is fairly clean a little pounded meat or chicken may be added to the animal broths. An occasional cup of weak tea is refreshing and stimulating. In the slighter cases fish and chicken may be allowed. In convalescence a nourishing diet should be carefully adapted to the digestive capacity.

Convalescence will be promoted by a change of air from town to country or the seaside. Care must be taken not to expose the patient to draughts or to sudden chilling of the skin. Iron and quinine, or the ammoniated tincture of quinine, will help the recovery of strength in adults, while iron and maltine, cod-liver oil, or Scott's emulsion are more suitable for children.

ADDITIONAL FORMULÆ

Powders for acute bronchitis with abundant stringy expectoration difficult to expel

℞ Acidi benzoici, gr. xij.
Pulveris gummi acaciæ, gr. lxxv.
M. et divide in pulv. vj. A powder every two hours.
(*Bamberger.*)

Powders to relieve the cough of acute bronchitis

℞ Morphinæ hydrochloridi, gr. jss.
Pulveris ipecacuanhæ, gr. iij.
Sodii bicarbonatis, gr. lxxv.
Sacchari albi, gr. lxxv.
M. et divide in pulv. xij. One every six hours.
(*Bamberger.*)

Mixture for acute bronchitis in children

℞ Vini antimonialis, ʒj.
Vini ipecacuanhæ, ʒij.
Liquoris ammonii acetatis, ʒiv.
Syrupi tolutani, iv.
Aquæ ad ℥ij.
M. f. mist. A teaspoonful every two hours for a child two years old. (*Whitla.*)

Belladonna spray for bronchitis and asthma

℞ Extracti belladonnæ, gr. j.
Aquæ, ℥ss.
M. f. sol. To be used with a Seigle's spray-producer every few hours.
(*Dr. Davies, of Sherborne.*)

Mixture for acute bronchitis

℞ Tincturæ veratri viridis, ʒjss.
Vini antimonii, ʒiv.
Tincturæ opii camphoratæ, ℥ijss.
Liquoris ammonii acetatis, ℥ij.

M. f. mist. A teaspoonful in a tablespoonful of water every two, three, or four hours (smaller doses for children).

(*Prof. Davis, M.D., Chicago.*)

Spray for inhalation to relieve cough from excessive hyperæsthesia of bronchial mucous membrane

℞ Extracti conii maculati (dissolved in rectified spirit), gr. iij.
Aquæ laurocerasi, ♏xx.
Potassii carbonatis, gr. viij.
Aquæ destillatæ, ℥j.

M. f. inhal. To be used warm. (*Lewin.*)

Mixture for acute bronchitis

℞ Ammonii chloridi, gr. xxx.
Tincturæ opii, ♏xij ad xxiv.
Syrupi senegæ, ʒvj.
Decocti althææ (1 in 10 or 20) ad ℥viij.

M. f. mist. Two tablespoonfuls every two hours.

(*Bamberger.*)

Mixture for acute capillary bronchitis

℞ Vini antimonialis, ʒiv.
Spiritus chloroformi, ʒiv.
Spiritus ammoniæ aromatici, ℥j.
Liquoris ammonii acetatis, ℥ij.
Aquæ ad ℥viij.

M. f. mist. A tablespoonful every two hours. (*Whitla.*)

Cocillana (bark) and **naregamia** (root) have been introduced in America as expectorants in "dry catarrhs," and as preferable to tartarised antimony. The dose of the former is 10 grains of the powdered bark every four or six hours, and of the latter 20 grains of the powdered root. Little is really known at present about these drugs.

CHAPTER XXV

TREATMENT OF CHRONIC BRONCHIAL CATARRH

Etiology — Varieties: "Chronic Winter Cough" — "Dry" Catarrh — Pituitous Catarrh, or Bronchorrhœa—Bronchiectasis—Bronchitis Putrida—Plastic Bronchitis—Physical Signs —*Indications for Treatment*—Vaccine-therapy—Treatment of Ordinary Winter Cough—Of Dry Catarrh—Alkaline Drinks and Sprays—Hot Aqueous Vapour for Inhalation—Mineral Waters—Ems—Apollinaris—Bourboule—Selters—Formulæ—Saline Aperients—Potassium and Sodium Iodide. BRONCHORRHŒA: Balsams and Gum Resins—Copaiba—Turpentine in Mixtures and Inhalations—Inhalation Respirator—Derivatives from Turpentine — Terpine — Terpinol — Terebene — Tar—Creasote—Menthol—Balsams of Peru, Tolu, Benzoin, Storax —Ammoniacum—Squill. PLASTIC BRONCHITIS: *Treatment.* BRONCHITIS PUTRIDA: Antiseptic Inhalations—Santal Oil—Myrtol—Cod-liver Oil. BRONCHIECTASIS: Intratracheal Injections—Creasote Vapour Baths—Posture—Surgical Treatment—Value of an Occasional Emetic—Manual Compression—Counter-irritation—Pneumatic Treatment—Climate—Mineral Waters—Treatment of Associated Constitutional Tendencies. Additional Formulæ.

THERE is, perhaps, no disease which is met with more frequently in Great Britain than **chronic bronchial catarrh.** The insular, humid, changeable climate is especially favourable to the maintenance of catarrhal conditions of the air-passages when once they are established; and this liability is increased in those who suffer from inherited or acquired hypersensitiveness of the bronchial mucous membrane.

The *chronic* form of bronchial catarrh is often the result of repeated *acute* attacks, or it is due to persistence of bacterial infection of the lungs, coupled with exposure to unfavourable meteorological conditions. It is frequently secondary to other diseases—to typhoid fever, to heart disease, to phthisis. It is sometimes caused by occupations which entail exposure to irritating dusts or gases. It is not seldom associated with pulmonary emphysema, in the production of which it plays a predominant part. It

is often encountered in connection with the gouty diathesis, as well as in association with rheumatism, and syphilis. But whatever may be the *predisposing* causes, the *exciting* cause, apart from mechanical or chemical irritants or the activity of micro-organisms, is almost invariably exposure to atmospheric vicissitudes. Fogs seldom fail to excite an attack in a susceptible subject.

It is met with at all ages, and is most troublesome to deal with and most dangerous at the two extremes of infancy and old age. It is sometimes comparatively slight, recurring regularly in severe weather in the form of what we call a chronic winter cough. There is also the "dry" form, the *catarrhe sec* of French authors, characterised by violent irritative cough, and scanty, tenacious expectoration difficult of expulsion. This is regarded by some as a "gouty" form. There is also the form attended by abundant muco-purulent secretion, the "*catarrhe pituiteux*" of the French; the "bronchorrhœa" of other writers.

Occasionally chronic bronchial catarrh is accompanied by structural changes in the walls of the bronchi, leading to dilatation of these tubes, and to the formation of the so-called *bronchiectatic cavities.*

The stagnation and decomposition of bronchial secretion in these cavities may impart an offensive odour to the breath and to the sputa, and this may also be due to putrid ulceration of the bronchial mucous membrane, giving rise to what is termed *bronchitis putrida*, or fœtid bronchitis.

A rare form of chronic bronchitis is characterised by the expectoration of mucinous casts of the smaller bronchi, and is known as *plastic bronchitis.*

It is scarcely necessary to enumerate the familiar symptoms and physical signs of so common a malady as chronic bronchitis: the cough more or less severe, the expectoration more or less abundant, the dyspnœa more or less grave, according to the extent of the diffusion of the disease or the presence of complications; the combination of good, often exaggerated,

percussion resonance with diffused harsh respiration, and various sonorous râles, rhonchal and sibilant, crepitating and humid, or musical and dry, while gurgling râles are heard over the bronchial dilatations. In some cases there is notable emaciation.

The **indications for treatment** will vary with the nature of the case.

It is, in the first instance, important to remove all sources of injury or irritation to the bronchial mucous membrane, in which the disease may have originated, or which may favour its continuance. Such conditions are not infrequently found in the nasal passages or in the naso-pharynx.

If it is dependent on occupation, this should be changed; if on climate, let your patient seek a better one. Is it dependent upon the existence of some other disease or constitutional state, as alcoholism, heart disease, syphilis, scrofula, gout, etc., then our remedies must be selected with due regard to the original disease or diathesis.

If examination of the sputum suggests that the condition is excited or maintained by micro-organisms, benefit may be derived from the appropriate autogenous vaccine. Frequently more than one organism will be detected: in that case the respective vaccines can be used in succession. It is only in a limited number of cases of chronic bronchitis that much benefit has been derived from vaccine-therapy, and the immunity acquired in these has hitherto proved, as a rule, quite transitory.

There are other indications for treatment which may be deduced from the symptoms of the disease itself. These are:

1. To modify the morbid secreting action of the bronchial mucous membrane.
2. To promote the expulsion of the morbid secretions which tend to accumulate in the air-tubes.
3. To calm irritative cough.
4. To give tone to the enfeebled bronchial walls.

5. In fœtid bronchitis, to suppress the putrid decomposition of the bronchial secretions.

Little is needed in the way of medical treatment for those slight forms of bronchial catarrh which are almost habitual with some persons during the winter. General hygienic measures should be prescribed, such as sufficiently warm clothing, residence in dry and protected localities, and in well-warmed and well-ventilated apartments; avoidance of all exposure to draughts or chills of any kind. A respirator may sometimes be worn with advantage during cold, damp weather. The food should be light and nutritious, and the bowels kept open by gentle saline aperients. The most troublesome symptom in these cases is usually a more or less harassing cough on rising in the morning, with some expectoration which may at times be difficult to expel. The best remedy for this is 4 or 5 ounces of an alkaline water, such as Ems or Apollinaris, with a little hot milk, early in the morning. In slight cases of this kind more good is often obtained by attention to the general health than by measures directed more definitely to the bronchial mucous membrane.

In cases of "**dry catarrh**" we meet with severe paroxysms of cough, attended by a very scanty secretion, which is tenacious and sticky, and difficult of expulsion, and when it is expelled is in the form of small pearly masses. The seat of this form of catarrh is in the smaller bronchi, and it is often associated with the gouty constitution. These cases are greatly benefited by the free administration of warm alkaline drinks and the inhalation of hot saline alkaline sprays, or the steam of hot water. The mineral waters of Ems, Apollinaris, Bourboule, and Selters are excellent for this purpose. Four to 6 ounces of Ems or Apollinaris, with 2 ounces of hot milk or whey, should be taken four or five times a day, and the hot spray of these waters inhaled twice a day or oftener.

If these mineral waters are not available, a very

good substitute is a mixture containing bicarbonate of soda and chloride of sodium, and with this mixture we may often advantageously combine some pills containing tartarised antimony (or ipecacuanha) and morphine, the latter for the purpose of allaying the hyperæsthetic condition of the bronchial surface, the former to increase the fluidity of the bronchial secretion.

The following prescription is useful :—

℞ Sodii bicarbonatis ... ... ʒj.
Sodii chloridi ... ... ʒss.
Ammonii carbonatis ... ... ʒss. ad ʒj.
Spiritus chloroformi ... ... ʒij.
Aquæ ... ... ad ʒvj.
Misce, fiat mistura. Two tablespoonfuls, with two of hot water, every four to six hours.

℞ Antimonii tartarati ... ... gr. ⅛
(*vel* pulveris ipecacuanhæ, gr. j.)
*Morphinæ acetatis (*vel* codeinæ, gr. ss.) gr. ¼
Extracti hyoscyami ... ... gr. ij.
Misce, fiat pilula. To be taken at bedtime.

Codeia should be preferred for gouty persons.

In the gouty this treatment should be combined with a saline aperient every morning, such as one or two teaspoonfuls of Carlsbad salts in a glass of hot water.

Potassium, sodium, and ammonium iodides are valuable remedies in gouty forms of chronic bronchitis; 3 to 5 grains of either may be added to each dose of the preceding mixture.

Potassium and sodium iodide also prove of much benefit when there is a tendency to asthma, and the bronchial secretion is tenacious and difficult of expulsion; large doses, from 5 up to 15 grains, of potassium iodide may be required to relieve these attacks of dyspnœa in this form of chronic bronchial catarrh.

In cases of chronic bronchial catarrh with profuse secretion, or **bronchorrhœa**, the object of our

* Refer to what is said at page 579, *ante*, as to the use of opium in these cases. The morphine should not be prescribed for the aged.

treatment should be to modify the morbid secreting action of the bronchial mucous membrane. Several drugs are believed to possess this power in some degree; notably, certain "balsams" and "gum resins." Copaiba, turpentine, tar, creasote, the balsams of Peru and of tolu, ammoniacum, are members of this group of remedies.

Some of these drugs contain substances which are eliminated by the bronchial mucous membrane, and may thus exercise a local influence over the existing morbid conditions.

Copaiba is often given, with or without the addition of chloride of ammonium, according to the following formula :—

℞ Copaibæ ... ... ʒij.
Mucilaginis acaciæ ... ... ʒvj.
Spiritus chloroformi ... ... ʒss.
Aquæ camphoræ ... ... ad ʒvj.
Misce, fiat mistura. Two tablespoonfuls three times a day.

Turpentine is more agreeable and as efficacious. It may be prescribed in capsules. Or it may be given as an emulsion, thus :—

℞ Olei terebinthinæ ... ... ʒj.
Mucilaginis acaciæ ... ... ʒij.
Misturæ amygdalæ ... ... ad ʒvj.
Misce, fiat mistura. One or two tablespoonfuls for a dose.

Turpentine is also well and readily administered by inhalation. A teaspoonful of the oil of turpentine may be vaporised from the surface of hot water, and directly inhaled with the vapour of water from any suitable vessel, or 20 or 30 drops of spirit of turpentine may be added from time to time to the water in a bronchitis kettle, when its vapour will be quickly diffused through the room; or the patient may wear a light perforated zinc **inhalation respirator,***

* This little inhalation respirator was devised by the author, and is made by Messrs. Squire, 413, Oxford Street, London. Messrs. Wyeth, of Philadelphia, also make it in a slightly modified form. Being made of *perforated* zinc it allows of the *free access of air*.

the sponge of which is charged from time to time with spirits of turpentine (Fig. 14). If the respirator is to be worn continuously some of the drugs used in inhalation are apt to make the lips and parts around sore: this may be prevented by smearing these parts with vaseline.

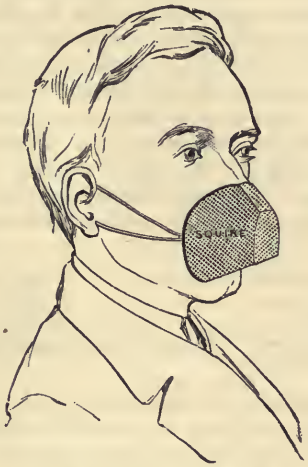

Fig. 14.—Dr. Yeo's respirator.

Professor S. Solis-Cohen says this is "one of the most useful, as it is one of the simplest, devices for the inspiration of medicinal vapours." *

Many cases of chronic bronchitis are greatly benefited by prolonged inhalations, wearing this respirator several hours a day for weeks at a time. Creasote, iodine, and chloroform may all be used for this purpose, and several other formulæ are given in the section on laryngeal phthisis. Antiseptic vapours are naturally most beneficial in cases of microbial origin.

* Hare's "System of Practical Therapeutics," vol. i., p. 829.

Various derivatives from turpentine have been used in the treatment of chronic bronchial catarrh.

Terpinol and *terpine hydrate* are very popular. *Terpinol* is an oily substance with a jasmine-like odour; it is said when taken internally to be wholly eliminated by the respiratory passages. It is best given in capsules, 5 to 10 daily, each containing a minim and a half; also in pills according to a formula to be found at the end of this chapter.

Terpine hydrate is a white crystalline body, and it seems to act on the respiratory mucous membrane in the same way as turpentine, but it has the advantage of not disturbing the digestive organs. Lépine has used it with great success in cases of bronchorrhœa. It is only slightly soluble in alcohol, so it is best to give it mixed with alcohol and glycerine:

℞ Terpine hydrate ... ... gr. lxiv ad lxxx.
Alcohol ... ... ℥v.
Glycerini ... ... ad ℥ij.

Misce, fiat mistura. A teaspoonful in some aromatic water three or four times a day.

Pills containing terpine hydrate ($2\frac{1}{2}$ or 5 grains) and heroin ($\frac{1}{24}$ grain) are very useful in catarrhs of the larger bronchi, but in aged people heroin, except for quite occasional use, should be avoided.

Terebene also has been given for the chronic form of winter cough. It may be given in capsules, or dropped on sugar, in doses of 5 to 20 minims; or it can be made into an emulsion with mucilage of tragacanth, or inhaled as a spray or from the sponge of the little respirator just described.

Tar is another remedy for bronchial catarrh; it is frequently given in the form of capsules, or as *tar-water*, or in pills or a syrup, and as an inhalation. It is of value in the treatment of chronic bronchial catarrh. It is an expectorant, as well as a tonic to the bronchial mucous membrane, and it has been suggested that it exerts its beneficial tonic effect on the respiratory mucous membrane in the act of

its elimination, stimulating the epithelial elements and their cilia.

Tar-water can be made by stirring one part of tar with ten of water for fifteen minutes, and decanting. A wineglassful may be taken several times a day.

Tar can also be made into pills either with liquorice-powder or powdered gum acacia. Equal parts of tar and liquorice-powder may be mixed together and made into 5-grain pills, two or three of which should be taken three times a day.

Or the syrup of tar of the United States Pharmacopœia can be used. A stronger form can be obtained by washing the tar with an alkaline water, or using tinctura quillaiæ saponariæ in its preparation.

Tar may be inhaled in the form of spray by pulverising tar-water in a Seigle's spray-producer; it may also be used as a fumigation; for this purpose good ship's tar should be employed, to which 10 per cent. of carbonate of soda should be added to neutralise the pyroligneous acid contained in it, which might be irritating to the respiratory passages. At first it is best to dilute the mixture with water, so as to get at the same time the emollient action of aqueous vapour on the part affected; subsequently the amount of water may be reduced, and at last the pure tar mixture with soda may be employed; this is simply poured on to a flat dish, and heated over a spirit-lamp. The tar vapours are evolved in the vicinity of the patient for a quarter of an hour or more at a time, once or twice a day, but it is desirable that the patient should remain all day in the room the air of which has been impregnated with tar vapour.

Much that has been said with regard to tar applies also to **creasote.** It can be given in the form of capsules, and then a few tablespoonfuls of warm milk or soup should be taken beforehand to avoid gastric irritation, or 1 or 2 tablespoonfuls of the creasote mixture of the British Pharmacopœia can be given three times a day. It can also be given in the form

of pills, each containing a minim, mixed with soap and crumb of bread.

Or it may be mixed with glycerine and any agreeable tincture, with a view of covering its taste, such as the following :—

℞ Creasoti ... ... ♏xvj.
Tincturæ chloroformi compositæ ... } āā ʒj.
Glycerini ... ... }

Misce, fiat mistura. A teaspoonful in water or milk three or four times a day.

We have also given it mixed with cod-liver oil—2 minims of creasote with 2 drams of cod-liver oil, three times a day—in cases of bronchitis putrida, with remarkably good results. A mouthful or two of milk should be taken before and after the dose.

But creasote is especially useful for inhalation, and it can be very readily inhaled by means of the perforated zinc respirator already referred to (Fig. 14, p. 593).

If there is much bronchial irritation as well as profuse secretion, the sponge of this inhaler can be charged with equal parts of creasote and ether, or creasote and chloroform ; or if a less decided sedative is required, an excellent mixture for the purpose consists of equal parts of creasote and spirits of chloroform.

If it is desirable to combine the emollient effect of the vapour of water with that of creasote, the latter may be vaporised by dropping it on the surface of very hot water, and their vapours inhaled together.

The employment of turpentine, tar, and creasote is especially indicated in cases of profuse bronchial secretion (bronchorrhœa), particularly when the sputa are offensive owing to the existence of putrefactive processes in the air-passages, or the presence of bronchiectatic cavities.

The inhalation of **menthol** is useful in the same class of cases ; it is found to allay cough as well as to promote expectoration.

The **balsams** of **Peru** and **tolu**, **benzoin**

and **storax,** are also given in chronic bronchial catarrh to modify the morbid secreting action of the respiratory mucous membrane. The well-known tincture in the B.P. contains three of these—benzoin, storax, and tolu—and is often found of great service in lessening the amount of secretion and diminishing the cough. It is necessary that this tincture should be rubbed up carefully with thick syrup or mucilage, so as to make an emulsion with the gum-resins it contains, or it will not mix with water, as—

℞ Tincturæ benzoini compositæ ... ... ℥ij.
Tincturæ tolutanæ ... ... ℥ss.
Oxymellis scillæ ... ... ℥iij.
Mucilaginis acaciæ ... ... ℥iv.
Vini ipecacuanhæ ... ... ℥ss.
Aquæ... ... ... ad ℨvj.
Misce, fiat mistura. Two tablespoonfuls three times a day.

This tincture may also be inhaled from hot water.

Another gum-resin of value in the treatment of the chronic bronchial catarrh of old people is **ammoniacum.** It is of much value as an expectorant in certain cases. It is given rubbed up with water, as in the mistura ammoniaci of the British Pharmacopœia, or combined with squill, as in the following formula :—

℞ Tincturæ camphoræ compositæ ... } āā ℥iij.
Oxymellis scillæ ... ... }
Misturæ ammoniaci... ... ... ad ℨvj.
Misce, fiat mistura. Two tablespoonfuls for a dose.

It is also one of the constituents of the pilula scillæ composita and the pilula ipecacuanhæ cum scillâ of the British Pharmacopœia.

Squill itself is a useful expectorant in many cases of bronchitis, especially in those cases which are intermediate between the acute and chronic forms. It is often combined with small doses of ipecacuanha and opium, as in the *pilula ipecacuanhæ cum scillâ* of the B.P., of which 5 to 10 grains may be given at bedtime with much advantage in many cases of chronic bronchial catarrh.

When secretion is profuse but is voided with difficulty, the following combination is very serviceable :—

℞ Liq. strychninæ ... ... ℥j.
Spt. ætheris ... ... } āā ʒss.
Spt. ammon. co. ... ... }
Aq. chloroformi ... ... ad ʒxij.

Misce, fiat mistura. Take two tablespoonfuls every six hours.

Some have found a Turkish bath (taken at home) most useful in cutting short intercurrent acute or subacute attacks. As soon as free perspiration is induced the tightness on the chest is relieved. After the bath the patient should retire to a well-warmed bed, and some terebene should be inhaled from the oro-nasal respirator described on p. 593.*

The following formula† is a good one in those cases intermediate between the acute and chronic forms to which I have just referred :—

℞ Tincturæ scillæ ... ... ℥ij.
Tincturæ camphoræ compositæ ... } āā ℥iij.
Spiritus ætheris nitrosi ... ... }
Liquoris ammonii acetatis ... ... ʒjss.
Aquæ camphoræ ... ... ad ʒvj.

Misce, fiat mistura. Two tablespoonfuls every five or six hours.

In rare cases of plastic bronchitis to which we have alluded our only indication, in the absence of any ascertained cause, is to aid expulsion of the casts. Inhalations of medicated steam, hot alkaline drinks, such as milk and soda water or Vichy water, and the use of liquefying expectorants will best meet this indication. Sometimes a brisk emetic may be needed as well.

In cases in which the expectoration tends to become fœtid, cases of so-called **putrid bronchitis**, and of **bronchiectasis**, our treatment should be directed to preventing or arresting the decomposition of the bronchial secretion. Inhalations of antiseptic

* *See* "Diseases of the Lungs," by Fowler and Godley, p. 109.

† Brompton Hospital Pharmacopœia.

agents which act also as expectorants are specially indicated, such as turpentine, tar, creasote, carbolic acid, etc., after the manner already described. In such cases the inhalation of a spray of a 2 to 4 per cent. solution of carbolic acid is exceedingly useful. The inhalation of chlorine and iodine has also been recommended.

Da Costa has found *santal oil* of great value in these cases. He gives 5 drops three to five times a day. *Myrtol* has also been highly extolled in the treatment of putrid bronchitis. It is a volatile oil obtained from the leaves of the common myrtle; when taken internally it is eliminated chiefly by the lungs, and acts as an antiseptic and deodorant. It is given in capsules each containing 2 minims (two of these are prescribed every two hours), and its administration is attended by a diminution of the expectoration and a disappearance of the offensive odour. Tincture of eucalyptus, turpentine, creasote, or tar may also be given internally. In these cases it is also advisable to combine tonic remedies with expectorants, so as to maintain the general strength; we should also see that the patient has a nutritious diet. The patient's apartment should be well ventilated, and the air disinfected; for this latter purpose nothing is more agreeable than oil of eucalyptus or pinol. A mixture of 1 part of eucalyptus oil or pinol to 6 parts of rectified spirit may be diffused through the air by means of a hand-spray, or by dipping cloths in it and suspending them in the room. An atmosphere so charged with eucalyptus vapour has a decidedly soothing and soporific effect, a real advantage in many cases.

The following is an excellent tonic and expectorant for such cases:—

℞ Ammonii carbonatis ... ... gr. xl.
Tincturæ nucis vomicæ ... ... ʒj.
Tincturæ cinchonæ compositæ ... ... ʒiv.
Spiritus chloroformi ... ... ʒij.
Infusi senegæ ... ... ad ʒviij.
Misce, fiat mistura. Two tablespoonfuls three times a day.

Or, when a more decidedly bracing tonic is required, we may give this :—

℞ Tincturæ ferri perchloridi ... ... ʒij.
Liquoris strychninæ ... ... ♏xl.
Spiritus chloroformi ... ... ʒij.
Aquæ... ... ... ad ʒviij.

Misce, fiat mistura. Two tablespoonfuls three times a day.

We have already referred to the good results to be derived from the administration in these cases of cod-liver oil with creasote. Cod-liver oil is of very great value in the emaciating forms of chronic bronchitis with profuse secretion.

In bronchiectasis, as in other cases with fœtid sputum, **intratracheal injections** of menthol (10 parts), guaiacol (2 parts), and olive oil (88 parts) have been advised. The throat being previously anæsthetised with a cocaine spray, a dram of this mixture is injected twice a day into the trachea, care being taken that the nozzle of the syringe has passed beyond the vocal cords. During the operation the patient should incline his chest strongly to the affected side, so as to carry the injection in that direction. The manipulation requires considerabld dexterity, as it must be carried out quickly ane confidently. The syringe used should be wholly made of metal. Good results have been reported from this mode of treatment by many physicians.

Creasote vapour baths have been found most effectual means for preventing the decomposition of the bronchial secretion in these cases. These vapour baths are given in a small room suitably arranged for the purpose. The creasote is vaporised from a metal saucer on a tripod by means of a spirit-lamp. The patient's clothes are protected by wearing a sort of smock-frock, his nostrils are plugged with cotton-wool, and his eyes also protected by goggles or a mask. The room is filled with dense clouds of vapour. The immediate effect is to cause the patient to cough violently and to expectorate profusely. At first the bath is given on alternate days for fifteen

to twenty minutes; then, if well borne, daily, and the duration gradually increased to an hour or an hour and a half. A remarkable increase of appetite is said to follow the use of these baths.

Postural treatment is sometimes effective in promoting the discharge of retained secretions from bronchiectatic cavities in the lungs. The patient should lie prone on his bed, and, with hands on the floor, lower his head to the level of his hands several times in succession. He should be encouraged to cough during these manœuvres.

Surgical treatment of bronchiectases, even with the assistance of X-rays, has not yet produced results that justify its recommendation.

In all forms of bronchitis with profuse expectoration it is well to remember the value of an occasional **emetic** in cases of chronic bronchial catarrh with profuse suffocative secretion. The mechanical compression which the lungs undergo in the act of vomiting not only tends to the expulsion of the mucus accumulated and retained in the air-passages, but it also relieves pulmonary engorgement by simultaneous compression of the blood-vessels.

Gerhardt has strongly recommended the application of **manual compression** to the chest and abdomen in cases where it is difficult by ordinary means to procure free expectoration and unloading of the air-passages of the morbid secretions accumulated in them. He maintains that manual pressure on the external surface of the thorax and abdomen, applied during expiration, leads to the following good results:—

1. Elevation of the diaphragm and a consequent reduction of the pulmonary dilatation.
2. Increase of vital capacity.
3. Diminution of the frequency of respiration.
4. Promotion of expectoration.

Cases in which the air-passages are occluded by viscid secretions which the feeble muscular power of

the patient is unequal to expel, are specially suitable for this mechanical treatment. The expiratory effort is directly strengthened by the associated manual pressure from without, and expectoration is also indirectly promoted by the more vigorous muscular activity resulting from increased supply of oxygen. Gerhardt mentions the case of a patient with large bronchiectatic cavities in the lower lobe of the left lung, in which by inhalations of turpentine he soon succeeded in removing the odour of the sputa, but the expectoration was small, and physical examination showed that the cavities remained for several days together constantly filled. He then endeavoured to promote and increase the expiratory effort mechanically by placing the patient on his right side, and daily employing manual pressure, by which means he succeeded in preventing the retention of the sputa.

Stokes estimated highly the effect of **counter-irritation** and revulsive treatment in chronic bronchial catarrh, and our own experience confirms his view. Stokes used to order a large portion of the chest to be sponged daily with a liniment composed of spirit of turpentine and acetic acid, so as to keep up an erythematous state of the skin. He thought that, besides the counter-irritation thus produced, some of the ingredients were absorbed by the surface.

No doubt the vapour of the more volatile constituent (turpentine) may be inhaled, and thus act locally on the bronchial mucous membrane. Patients themselves learn the value of these embrocations, and ask that they may be renewed. The linimentum terebinthinæ of the B.P. is a useful form, to which may be added, in the cases of scrofulous children, a dram or two of tincture of iodine to the ounce. The linimentum terebinthinæ aceticum (B.P.) is also very valuable; it contains oil of turpentine, acetic acid, and camphor.

The linimentum crotonis is likewise useful, as a revulsive, in some obstinate cases of chronic

bronchial catarrh; the disadvantage attending its use is that it brings out an unsightly eruption of the skin, which may be avoided by diluting with twice its bulk of linimentum saponis.

The following is the formula for Stokes's embrocation :—

℞ Spiritus terebinthinæ	... ...	℥iij.
Acidi acetici	... ...	℥ss.
Vitelli ovi	... ...	℥j.
Olei limonis	... ...	℥j.
Aquæ rosæ	... ...	℥vj.

Misce, fiat linimentum.

We must now consider, briefly, the value of **alterations of atmospheric pressure** in the treatment of chronic bronchial catarrh. This "pneumatic" method of treating chronic catarrh of the air-passages is more common in other European countries than in England, and most of the large cities and many health resorts on the Continent possess "pneumatic institutions" for the treatment of pulmonary affections by alterations of atmospheric pressure.

Various portable apparatus for this purpose,* notably one devised by Waldenberg and another by Schnitzler, are also in use in Germany and Russia.

The "Pneumatic Chamber," * in which the patient remains for some time, is chiefly employed for inspiration of compressed air; but by means of suitable arrangements he can be made to *inspire* compressed air and *expire* into rarefied air. So also, by means of the portable apparatus mentioned, he can either *inspire* compressed or rarefied air, or *inspire* the former and *expire* into the latter.

The compressed air can also be made, by a slight addition to the apparatus, to flow through solutions of tar, creasote, eucalyptol, pinol, etc., and so become impregnated with vapours having a specific action on the bronchial mucous membrane.

It has been found that chronic bronchial catarrhs,

* Fully described in the author's translation of Oertel's Respiratory Therapeutics."

even when obstinate and of long standing, are favourably influenced by pneumatic treatment. The pressure which compressed air exerts upon the swollen and hyperæmic respiratory mucous membrane lessens the calibre of its vessels and reduces the afflux of blood, while it promotes the efflux of blood and the fluids of the tissues, and in this way diminishes the swelling.

This diminution of the flow of blood to the mucous membrane and promotion of the efflux of fluids from it lessens the amount of secretion and widens the lumen of the tubes, giving freer passage to the inflowing air, and thus increases the amount of air that can enter and leave the air-cells, and greatly aids pulmonary ventilation.

If there is but little secretion in the bronchi, and expectoration is difficult, while the tubes remain permeable to compressed air, then this air of higher tension rushes into the partially collapsed air-cells beyond the tubes, and thus imparts increased expulsive power and facilitates expectoration.

Expectoration is also promoted by expiration into rarefied air, as by a simple physical process it removes hindrances to the outflow of air from the air-passages. It is not needful here to enter more fully into the theory of pneumatic treatment, but those who have had the largest opportunities of watching its results maintain that its beneficial effect in the majority of cases of chronic bronchial catarrh is permanent, that the catarrh is often entirely cured, and even in incurable cases, dependent on some more deeply seated pulmonary lesion or cardiac affection, it is greatly alleviated.

At Reichenhall, near Salzburg, a very complete establishment exists for the treatment of respiratory affections in the Pneumatic Chamber.

The influence of **climate** in the alleviation, as well as in the causation, of chronic bronchial catarrh is universally known.

Those who suffer habitually from bronchial catarrh in the winter should, if possible, pass that part of the

year in a climate where they may be exposed as little as possible to sudden changes of temperature, to chilling fog and mist, and to cold winds, and where they can get, without danger, a certain amount of exercise in the open air with plenty of sunshine.

The choice of any particular place is often determined by considerations of convenience, expense, or society. In England the best wintering-places for most cases of chronic bronchial catarrh are Torquay, Falmouth, Tenby, Penzance, Bournemouth, the Undercliff in the Isle of Wight, and St. Leonards.

But a drier and warmer winter climate than can be obtained in England is advisable in many cases, and for these we can choose from the various resorts on the Western Riviera, one of the best of which is Mentone; or, if we consider the climate of the Riviera too exciting, we may select Algiers or Tangier, Orotava, or Las Palmas; or, if we wish a very dry climate, there is the desert climate in Egypt.*

Madeira, Huelva, Malaga, Ajaccio, Palermo, Corfu, and many other places offer also suitable winter quarters for the catarrhal subject. Perhaps the best for the majority of patients is Madeira, which is now accessible by the fast Cape steamers in three or four days.

Some German physicians prefer the more bracing but dry and sunny climate of Meran and Arco for their catarrhal patients in winter. At Meran treatment in the Pneumatic Chamber can be obtained, and in the appropriate seasons the grape or milk or whey cures can be had.

A course of **mineral waters** is often prescribed with advantage for sufferers from chronic catarrhal affections of the air-passages.

In France it is very common for such patients to

* It is not always judicious to advise those advanced in years to go so far as Egypt. The changes of temperature are often very great and the cold is keenly felt there, and the fatigue of the journey proves exhausting to many.

be sent during the summer months to a sulphur * spa in the Pyrenees.

The French physicians are fond of dividing their catarrhal cases into three classes—the scrofulous, the arthritic (or rheumatic and gouty), and the dartrous. By the "dartrous" they mean constitutions prone to cutaneous eruptions. This classification has always appeared to us somewhat artificial, but they found upon it indications for the application of their different mineral springs to individual cases.

The arthritic or gouty cases are sent to Eaux Bonnes, Cauterets, or St. Sauveur in the Pyrenees, or to St. Honoré in the department of Nièvre; if the catarrh is irritative and congestive, to Mont Dore, La Bourboule, or Plombières. The scrofulous are sent to Barèges in the Pyrenees, to Aix in Savoy, or the adjacent Challes, or to Uriage. The "dartrous" or "herpetic" are sent to La Bourboule or Royat.

The German physicians, on the other hand, consider those mineral springs which contain chloride of sodium in small quantity, or, still better, chloride of sodium combined with carbonate of soda, and which contain also free carbonic acid, as specially suitable to the treatment of chronic catarrh of the air-passages.

Ems is pre-eminently the spa for this purpose, as it contains both chloride of sodium and carbonate of soda in small quantity. *Neuenahr* has somewhat similar properties. *Soden*, near Homburg, is also the type of a weak chloride of sodium water containing free carbonic acid, and it deservedly enjoys a great reputation in Germany for these cases.

Reichenhall offers salt springs, and "*salines*" where patients can promenade and inhale the emanations from the "graduation houses," as well as facilities for pneumatic treatment.

Weissenberg, near Thun, in Switzerland, with a

* Sulphur in 5- to 10-grain doses three times a day was recommended by Graves in the treatment of severe chronic bronchitis with abundant expectoration. He maintained that it lessened the amount of secretion and facilitated its expulsion.

hot sulphate of lime spring, and a moderate elevation, is considered by the Swiss physicians an excellent summer resort for sufferers from chronic catarrh of the air-passages.

When chronic bronchial catarrh occurs in obese middle-aged people who are free livers, a course of some more active mineral spring is indicated, and such patients derive advantage from a few weeks' treatment at Kissingen, Marienbad, or Carlsbad.

In all these health resorts the various kinds of baths available enable the physician to submit his patient, if he wishes, to those "repeated energetic sweatings" of which Niemeyer speaks so highly, powerful revulsion to the skin being undoubtedly an efficient means of relieving bronchial congestion.

After one of these courses, which, it must be remembered, are only taken in the warm season, it is usually advisable to spend two or three weeks in some moderately elevated, bracing mountain resort, and amongst pine-forests, such as may be found in the Black Forest, or in Switzerland.*

If, as has already been said, the bronchial catarrh is associated with the existence of some other disease or constitutional state, we must not lose sight in our therapeutic efforts of the original disorder.

In the case of scrofulous children we must look carefully to the general nutrition, give cod-liver oil, enjoin residence at the seaside, the use of salt-water baths, free exercise in the open air in suitable weather, and mix some iodine with our embrocations.

In these cases the syrup of the iodide of iron is very useful, and it may be combined with cod-liver oil. Hypophosphite of lime is also often of remarkable value in treating the chronic bronchial catarrh of children and young people.

In the gouty, as we have already pointed out,

* Fuller details relating to these and other resorts will be found in the author's work on "The Therapeutics of Mineral Springs and Climates."

alkaline waters, saline purgatives, potassium iodide, and ammonium chloride are the best remedies, a few doses of colchicum being occasionally required. Opiates are to be avoided.

In cases associated with a tendency to cutaneous eruptions arsenic will be useful.

If there is a well-marked syphilitic taint, we should of course employ iodide of potassium.

When chronic bronchial catarrh is a complication of heart disease, it will often be necessary to enjoin strict repose in a warm but well-ventilated apartment; we must also give supporting food and medicines, and some form of alcoholic stimulant is of great value. In many cases of mitral regurgitation digitalis will be helpful, and in feeble anæmic cases it may be combined with iron.

It is especially necessary in these cases to obtain free and regular evacuations from the bowels, for by unloading the intestines the descent of the diaphragm is facilitated, and any derivation of fluid from the portal venous system tends, indirectly, to relieve the engorgement of the right side of the heart.

A very useful form of aperient for such patients, which is efficacious without being depressing, is a pill of 2 or 3 grains of watery extract of aloes, and ½ or ¾ grain of ipecacuanha powder at bedtime, followed the next morning by 1 or 2 teaspoonfuls of Carlsbad salts in a tumblerful of hot water.

ADDITIONAL FORMULÆ

Mixture for chronic bronchitis with emphysema

℞ Ammonii carbonatis, gr. xl.
Tincturæ nucis vomicæ, ♏lxxx.
Tincturæ scillæ, ʒiv.
Infusi serpentariæ ad ℥viij.

M. f. mist. Two tablespoonfuls for a dose. (Digitalis should be added when there is dilatation of right side of heart.)
(*Fothergill.*)

"Routine" mixture for chronic bronchitis

℞ Ammonii carbonatis, gr. xxiv.
Tincturæ scillæ, ʒij.
Tincturæ camphoræ compositæ, ʒij.
Infusi senegæ ad ℥viij.

M. f. mist. Two tablespoonfuls for a dose. (*Iodide of potassium* is added if expectoration is difficult; *lobelia* if there is much dyspnœa.) (*Suckling.*

Expectorant mixture in chronic bronchitis of old people

℞ Ammonii chloridi, ʒj.
Tincturæ camphoræ compositæ, ʒj.
Misturæ ammoniaci ad ʒxx.
M. f. mist. A tablespoonful four times a day in water.
(*Whitla.*)

Potassium citrate syrup as an expectorant in chronic bronchitis

℞ Potassii citratis, ʒj.
Succus limonis, ʒjss.
Syrupi ipecacuanhæ, ʒss.
Tincturæ camphoræ compositæ, ʒiij.
Syrupi, ʒiij.
M. f. syrup. A dessertspoonful every two hours.
(*Therap. Gaz.*)

Creasote pills for chronic bronchial catarrh

℞ Creasoti, ♏xij.
Pulveris saponis, gr. xv.
Micæ panis, ʒss.
M. et divide in pil. xij. One or two three times a day.
(*Whitla.*)

Inhalation for bronchorrhœa and bronchitis fœtida

℞ Acidi carbolici, ʒss.
Tincturæ opii camphoratæ, ʒiij.
M. A teaspoonful to be inhaled freely from half a pint of hot water. (*Prof. Davis.*)

Inhalation for bronchorrhœa

℞ Acidi carbolici, ♏viij.
Olei pini pumilionis, ♏xx.
Aquæ ad ʒj.
M. To be diffused from the surface of water kept boiling.
(*Dr. R. Lee.*)

Antiseptic inhalation for fœtid bronchitis

℞ Thymol, ʒj.
Acidi carbolici, ʒij.
Creasoti, ʒij.
Spiritus chloroformi, ʒj.
M. f. inhal. (*Whitla.*)

Pills for chronic bronchitis

℞ Pulveris senegæ, ʒj.
Pulveris ipecacuanhæ, gr. vijss.
Olei terebinthinæ, ʒj.
Pulveris althææ, q.s.
Mucilaginis acaciæ, q.s.
M. f. pil. l. (To be kept in orris powder.) One three or four times a day. (*Bamberger.*)

Mixture for chronic bronchial catarrh

℞ Ammonii chloridi, ʒj.
Codeinæ sulphatis, gr. ij. ad iv.
Ext. glycyrrhizæ liq., ʒj.
Aq. destillatæ ad ʒij.
A teaspoonful every two hours in water. (*Hare.*)

Mixture for chronic bronchitis and bronchorrhœa

℞ Extracti eucalypti fluidi, ʒj.
Ammonii chloridi, ʒij.
Extracti glycyrrhizæ, ʒij.
Glycerini, ʒiij.
M. A teaspoonful (in water) four to six times a day.
(*Bartholow.*)

An expectorant in bronchial catarrh

℞ Tincturæ sanguinariæ, ʒj.
Tincturæ lobeliæ, ʒj.
Vini ipecacuanhæ, ʒij.
Syrupi tolutani, ʒss.
M. A teaspoonful every three hours. (*Bartholow.*)

Mixture for bronchorrhœa

℞ Balsami copaibæ, ʒijss.
Pulveris gummi acaciæ, ʒijss.
Syrupi menthæ, ʒv.
Aquæ menthæ ad ʒvj.
M. f. mist. Two tablespoonfuls night and morning.
(*Bamberger.*)

Mixture for "dry" chronic bronchial catarrh

℞ Potassii iodidi, ʒss.
Potassii bicarbonatis, ℥ss.
Ammonii chloridi, ʒij.
Liquoris morphinæ hydrochloridi, ʒj.
Aquæ chloroformi ad ℥viij.

M. f. mist. A tablespoonful every four or six hours, or a teaspoonful every two hours.
(*Whitla.*)

Terpene mixture for chronic bronchial catarrh with profuse secretion

℞ Terpene, gr. vijss.
Alcohol, ʒv.
Syrupi catechu, ℥j.
Aquæ ad ℥iv.

M. f. mist. A tablespoonful every three hours.
(*Dujardin-Beaumetz.*)

Mixture for rheumatic bronchitis

℞ Sodii salicylatis, ʒvj.
Glycerini, ℥ss.
Vini colchici radicis, ʒvj.
Syrupi scillæ compositæ, ℥jss.
Tincturæ opii camphoratæ, ℥ij.

M. f. mist. A teaspoonful in a little water every three or four hours.
(*Prof. Davis, M.D., Chicago.*)

Compound tar pills for chronic bronchial catarrh

℞ Picis, gr. xviij.
Pulveris benzoini, gr. xviij.
Pulveris ipecacuanhæ compositæ, gr. ix.

M. f. pil. xij. One or two three times a day.
(*N. Guéneau de Mussy.*)

Terpinol pills for chronic bronchial catarrh

℞ Terpinol, gr. jss.
Sodii benzoatis, gr. jss.
Syrupi, q.s.

Ut f. pil. Three or four of these pills are given three times a day. (*Dujardin-Beaumetz.*)

Terpene pills

℞ Terpene, gr. xxx.
Sacchari albi, q.s.
Acaciæ gummi, q.s.

Ut f. pil. xx. One thrice daily, immediately after food.
(*Wyss.*)

Linctus for irritative cough

℞ Succi limonis, ʒij.
Mucilaginis acaciæ, Syrupi simplicis āā ʒv.
Aquæ chloroformi, ʒiv.

M. f. linctus. One or two teaspoonfuls occasionally.

Cough syrup for bronchial or laryngeal catarrh

℞ Antimonii tartarati, gr. j.
Ammonii chloridi, gr. lxxx.
Extracti glycyrrhizæ, gr. xx.
Morphinæ hydrochloridi, gr. j.
Syrupi tolutani, Aquæ laurocerasi āā ℥j.

M. f. syrup. A teaspoonful every two, three, or four hours. This should not be prescribed for *old* people on account of the morphine it contains, or only with great caution.

Simple expectorant mixture

℞ Tincturæ benzoini comp., ʒij.
Syrupi tolutani, ʒiij.
Misturæ amygdalæ ad ℥vj.

M. f. mist. Two tablespoonfuls for a dose.

CHAPTER XXVI

TREATMENT OF ASTHMA (SPASMODIC ASTHMA, BRONCHIAL ASTHMA), HAY FEVER AND EMPHYSEMA

ASTHMA: Essential Nature of an Asthmatic Paroxysm—Two Forms, the *Spasmodic* and the *Catarrhal*—Description of the Paroxysm—Auscultatory Signs — Asthma a Respiratory Neurosis — *Treatment* of the *Paroxysm* — Morphine with Atropine — Chloroform — Ether — Nitrite of Amyl — Nitroglycerine, Sodium Nitrite — Iodide of Ethyl — Chloral Hydrate — Adrenalin Chloride — Fumigation — Cigarettes — Tobacco — Nitre Papers — Stramonium — Datura Tatula — Cigarettes d'Espic—"Carton Fumigatoire" — Himrod's and other Cures — Arsenical Cigarettes — Coffee and Caffeine — Ammonia Vapour—Emetics—Potassium Iodide—Belladonna —Tucker's Asthma Remedy—Lobelia—Grindelia—Conium—Hyoscine — The Bromides — Strychnine — Arsenic — Asthma and Micro-organisms—Vaccines—Asthma and Naso-pharyngeal Disease — Nasal Treatment — Electricity — Pneumatic Treatment — Inhalations of Oxygen — Medicated Vapours—The Mont Dore Cure — The Correct Pathology deducible from Therapeutic Observations — Climatic, Dietetic, and Hygienic Management.

HAY FEVER, or HAY ASTHMA: Two Forms, *Catarrhal* and *Asthmatic*—Causes—Symptoms—*Indications for Treatment*—Change of Residence—Local Applications—Oily Sprays—Antiseptic Lotions, etc.—Cocaine—Adrenalin Chloride—Tucker's Specific—Atropine and Morphine—Inhalations—Operative Measures—Constitutional Treatment—Pollantin.

EMPHYSEMA: Causes — Effects — *Indications for Treatment* — Climate—Pneumatic Treatment.

Additional Formulæ.

ASTHMA

THE essential condition of an attack of **asthma** is the existence of a state of spasmodic contraction of the bronchial muscles—of those unstriped muscular fibres that have long been known to enter into the structure of the walls of the bronchial tubes, and to extend even to their finest ramifications. Spasm of these muscular fibres is the essential element in the asthmatic attack. In a case of purely *spasmodic* asthma, of the ordinary

transitory character, this condition of bronchial spasm is a complete and simple explanation of the phenomena of the asthmatic paroxysm. But asthma is not always such a simple matter. In what is termed "*bronchial* asthma" the asthmatic attack is associated with bronchial catarrh, and the catarrhal condition seems frequently to bear a causative relation to the asthmatic paroxysm, as well as to intensify it and to render it less transitory and more continuous.

Clinically, then, we have to deal with two forms of asthma, the one *simply spasmodic*, the other spasmodic also, as its essential element is spasm, but *complex* also, as there is coexistent bronchial catarrh.

We have stated the case thus simply at the outset for the sake of clearness. These statements, however, have been the subject of much controversy—a controversy which we shall not be able altogether to avoid. The treatment of asthma is a remarkable illustration of the fact that a therapeutic observation is often an experiment in practical pathology, and is calculated, in some obscure morbid conditions, to throw great light on their true nature and causation. In such instances, the pathology of the morbid state under consideration can be more clearly and fully examined after we have considered the manner in which its phenomena are influenced by the introduction of those modifying agencies which we sum up in the word "treatment."

A severe paroxysm of spasmodic asthma may be thus described:—

Suddenly, without any warning, often in the middle of the night, or between two and four in the morning, the subject of asthma wakes up with an attack of urgent dyspnœa upon him. In some cases premonitory signs are noticed, which vary greatly in character. Some complain of flatulent dyspepsia as a forerunner of the attack; others of languor, headache, depression, and sleepiness; others of unusually high spirits; and many notice a tendency to pass large quantities of pale urine of low specific gravity, as in

hysteria and other emotional nervous states. Some complain of slight cough, and a feeling of irritation about the upper air-passages, and a slight sense of constriction in the chest, before the onset of the paroxysm.

The dyspnœa usually increases rapidly in intensity, and we find our patient sitting up in bed with arms fixed, shoulders raised, and head thrown back on the pillows, which are piled up behind him to support him in this position; we find him gasping for breath, taking short, forced inspirations, followed by relatively prolonged, noisy, wheezing expirations.

He is unable to move, or even sometimes to articulate a single word. The extremities are cold, owing to the interference with the circulation which this pulmonary spasm presents, while the face is often covered with beads of perspiration.

If the attack occurs in the daytime, the patient will remain riveted in his chair in this same attitude, with his arms fixed and rigid, until the violence of the paroxysm subsides; or you may find him in the erect attitude, grasping some convenient support.

The countenance is sometimes pale and anxious, sometimes flushed and congested, sometimes dusky and livid.

The chest is usually distended, and hyper-resonant on percussion, and the diaphragm is depressed. There is plenty of air in the lungs—too much, indeed—but it cannot get out and be renewed! On auscultation peculiar prolonged cooing, or whistling, or wheezing sounds may be heard, with varying intensity, all over the chest, especially during expiration.

If the attack is associated with the existence of bronchial catarrh, sonorous, sibilant, and crepitating râles will also be heard on auscultation.

As the attack comes to an end there is usually, though not invariably, a small amount of characteristic expectoration consisting of small, transparent, pearly pellets the size of a pea, or smaller.

What is the nature of this remarkable paroxysm?

We look upon asthma as a *respiratory neurosis*, and the asthmatic seizure as essentially a disturbance of respiratory innervation, what Trousseau called an "*epilepsy of the lungs.*"

That the attack may be dependent on the development or retention of some toxin in the blood, the outcome of disturbed metabolism, as maintained by some writers, is probable enough.

Those who admit the essentially nervous-spasmodic nature of the asthmatic paroxysm are not all agreed as to the precise extent of muscular area over which the spasm extends. For some it is a spasm of the diaphragm chiefly—the diaphragm, it is said, is rigidly and convulsively fixed in its extreme inspiratory position; for others it is a spasm of all the inspiratory muscles—the diaphragm, the intercostals, scaleni, trapezii, and all the muscles that take part in inspiration; for others the spasm is limited to the bronchial muscles, the involuntary muscles that are found in the smaller bronchial tubes, and for them the asthmatic paroxysm consists in a spasmodic contraction of these muscles, diminishing the calibre of the smaller air-tubes, and resisting alike both the ingress and egress of air; finally, there are others who think that both these sets of muscles are affected, the bronchial muscles within as well as the respiratory muscles without the lungs.

Such an attack as we have described, if unrelieved by any remedy, may last, with some variations in its severity, from two to six hours; the patient may then fall asleep, and awake perfectly well; or there may remain a slight tendency to wheezy and difficult respiration for a day or two.

Sometimes, however, the paroxysms will recur, with longer or shorter incomplete remissions, for four or five days (or nights), and then the attack will pass away and the normal state of health be re-established, and months, or even years, may elapse without any return.

During these intervals there may be no discernible

evidence of the existence of any disease of the chest, unless the attacks have been numerous, and have recurred within comparatively short periods of time during many years; then, as you may suppose, these continued, repeated, and violent disturbances of the respiratory function lead to permanent injury and disease of the thoracic viscera; pulmonary emphysema and chronic bronchial catarrh become established, there is more or less constant dyspnœa on any exertion, and as age advances the right side of the heart dilates, and finally embarrassment of the circulation with tricuspid insufficiency and dropsy may lead to a fatal issue. But these latter conditions are the consequences of asthma—they are not asthma, the disease with which we are now concerned.

Sufferers from asthma, however, do not all have attacks of the severity of the one described; attacks of minor severity are very common. The duration also of the severe attacks, in certain very bad cases, is much longer, and may continue with little intermission for many weeks.

Asthma, then, we repeat, is a *respiratory neurosis*, attended with spasm of the bronchial muscles, preventing both the ingress and egress of air in respiration. In some cases it is associated with bronchial catarrh, in others it is not.

With these few preliminary observations we are now in a position to enter on the consideration of the **treatment** of asthma.

And first, with regard to the treatment of the asthmatic paroxysm when it is established.

We know of no remedy so generally efficacious in cutting short a severe fit of asthma as **morphine** administered hypodermically, and we are accustomed to add a small dose of atropine to the morphine. We give from $\frac{1}{6}$ to $\frac{1}{3}$ grain of the acetate or hydrochloride of morphine, with $\frac{1}{120}$ or $\frac{1}{60}$ grain of the sulphate of atropine. A hypodermic injection of this kind will often subdue the most severe paroxysm of spasmodic asthma in a few minutes.

It is a remedy, however, which has to be used with great discretion, and which should be strictly reserved for the very severe paroxysms. It has this drawback, that it is not safe to leave it in the hands of the patient or his friends. It must be reserved for administration by the physician himself. Sooner or later, however, the patient acquires for himself the knowledge of the relief which an injection of morphine brings, then he learns to apply it to himself; and the morphine habit becomes occasionally established.

It should *never* be employed in the bronchitic asthma of aged people, or whenever there are signs of coexisting profuse bronchial catarrh, unless the suffering from dyspnœa is extreme and other remedies have failed to give relief; and in that case only a small dose should be given, and its effect carefully watched.

The inhalation of **chloroform** is a favourite remedy with some to relieve the asthmatic paroxysm, and it is undoubtedly a valuable resource in many cases; but there are patients who have a great dread of inhaling chloroform, and its use should be reserved for those cases where there may be good reasons for avoiding the employment of morphine, and, when given, it should not be pushed to complete insensibility. Its effects, however, are very evanescent.

Ether in the form of Hoffmann's anodyne often gives temporary relief.

The inhalation of **nitrite of amyl,** 3 to 5 minims (best in capsules), also gives temporary relief; but its effect is evanescent, and in severe cases the improvement does not last more than ten or twelve minutes, when the dyspnœa gradually returns. The effect of nitro-glycerine also passes away quickly, but that of sodium nitrite is more lasting.

Attacks of paroxysmal dyspnœa which occasionally come on in advanced stages of renal disease—the so-called cases of uræmic or renal asthma—are best treated by inhalations of chloroform or nitrite of amyl, and must *on no account whatever be treated by opiates.* If you give opiates in any form in these

cases, you may relieve the dyspnœic paroxysm, but it may be at the expense of your patient's life.

The inhalation of **iodide of ethyl**—10 to 15 minims or more on a piece of lint, held in the palm of the hand—has been strongly advocated for the relief of the asthmatic paroxysm, and we have found it useful in many cases of no great severity, and in cases associated with bronchial catarrh. Martindale's capsules of chloroform (10 minims) and iodide of ethyl (5 minims) may be used.

Chloral hydrate is another remedy in great favour with some physicians. It must be given in a full dose—30 to 40 grains—and its administration is frequently followed by partial, if not complete, subsidence of the paroxysm.

Occasionally a paroxysm of asthma may be cut short by introducing into each nostril a small pledget of cotton-wool soaked in **adrenalin chloride.** This solution should not be of greater strength than 1 in 5,000, or it may excite facial neuralgia. Leave the pledgets *in situ* for three or four minutes, then by pressing on the outside of each nostril squeeze out their contents, and withdraw the pledgets with a pair of forceps. Patients who derive benefit from this remedy are usually greatly improved, sometimes completely cured, by subsequent application of the galvano-cautery to the nasal septum.

Adrenalin chloride has also been prescribed in the form of sprays, but we have learnt by experience that patients cannot safely be trusted with sprays, to use when and as they please. Hypodermic injections (5–10 minims of the 1–1,000 solution) have also been given with success, but are undesirable because of their action on the wall of the arterioles.

Adrenalin chloride does not agree with all patients, causing delirium in some.

In many instances the paroxysms of asthma, especially the less severe ones, can be arrested, or favourably modified, or more or less kept under, by **fumigations** of various kinds.

When the paroxysm is not so severe as to disable the patient from smoking, a convenient mode of inhaling the fumes of the remedies employed is by smoking cigarettes composed of or impregnated with these drugs. If the patient is unable to smoke, these remedies may be burnt close to him, and their fumes diffused through the air of his apartment.

Simply smoking tobacco, to those unaccustomed to its use, will occasionally subdue an attack; but its use is attended by the well-known nausea and faintness experienced by beginners in the use of "the weed." Inhaling the fumes of **nitre paper**, i.e. paper which has been soaked in a saturated solution of potassic nitrate, is a popular as well as a very efficacious remedy in many cases. Paper so charged may be rolled up in the form of cigarettes and smoked; or it may be freely burnt in the patient's apartment. It is especially in the purely spasmodic form that these fumes are most useful. In most cases it is necessary to burn the paper freely so that the room may be filled with a dense cloud of the fumes.

Many persons who are subject to attacks of asthma keep nitre paper at hand in their bedrooms, and begin burning it on the first warning of the approach of an attack.

Most of the medicated cigarettes and powders which are sold for the relief of asthma contain **stramonium** or *belladonna*, or both; the former is a drug which has long maintained, and justly so, a very high position as a remedy for asthma.

Some of these cigarettes contain opium also. The *Datura tatula*, a plant closely allied to the *Datura stramonium*, is the basis of others of these remedies.

The celebrated *Cigarettes d'Espic* are said to be made of the following ingredients:—

Belladonna leaves	$5\frac{1}{2}$ parts.
Hyoscyamus leaves	$2\frac{3}{4}$,,
Stramonium leaves	$2\frac{3}{4}$,,
Phellandrium aquaticum	1 part.
Extract of opium	$\frac{1}{8}$,,
Cherry-laurel water	a sufficiency.

The dried leaves, stripped of their stems, are cut small, well mixed, and then moistened with the opium dissolved in the cherry-laurel water. The paper used for making the cigarettes is also soaked in an infusion of these leaves in cherry-laurel water. Usually in making these cigarettes a little nitrate of potash is added to the infusion to make them burn freely.

The fumes of stramonium at once relieve certain asthmatics, but they fail to do so with others—especially, it is said, with those who use tobacco habitually. The first effect is seen in relief of spasm, and then, with the onset of cough, loose sputum is expectorated freely, and often in large quantities.

Some of the fuming-papers that are sold for the relief of asthma contain potassium iodide, and others potassic chlorate, as well as potassic nitrate.

The *carton fumigatoire* of the French Codex is a very useful preparation. It contains nitre combined with powdered belladonna, stramonium, digitalis and lobelia leaves, and myrrh and oliban. Pieces are burnt in the patient's room.

Some of the powders sold as patent medicines, and now largely employed by asthmatics, are often very useful in relieving the dyspnœa, but they are used much too freely, and are apt to produce a seriously depressing effect on the heart.

This may certainly be said of "Himrod's Cure for Asthma" and of "Senier's green powder."

It has been stated that Himrod's cure does not contain stramonium; it certainly contains a drug which causes dilatation of the pupils. It has also been stated that the following is a good imitation of it:—

℞ Lobelia, powdered ... ...
Black tea, powdered ... ... } āā 1 oz.
Stramonium leaves, powdered ... ...

Pour upon this mixture 2 oz. of a saturated solution of nitrate of potash, mix thoroughly, and dry.

The fumes of arsenical cigarettes prove of great service to many asthmatics. They are usually made

by dissolving 15 grains of arsenite of potash in half an ounce of distilled water, and saturating unsized paper with it. This is afterwards dried, and cut into twenty pieces, each of which is rolled up into a cigarette. The smoke from the cigarette must be drawn into the bronchial tubes by a slow inspiration.

Strong **coffee** is a popular but two-edged remedy for relief of asthma; it should, however, be taken on an empty stomach, for it is necessary that it should be very strong, and the tannin it contains, if the stomach is full, precipitates the peptones, and thus disturbs digestion, and may become another exciting cause of dyspnœa.

But instead of coffee, **caffeine**, or the **citrate of caffeine**, is now extensively used in the treatment of paroxysmal neuroses, and we have found it of undoubted efficacy in the treatment of asthma, especially in preventing the attacks or in diminishing their severity. Two or three grains should be given with a little sugar of milk in a powder about an hour before bedtime, and again during the night if necessary; or it may be taken as a precautionary measure an hour before lunch or dinner.

It may also be given hypodermically made into a solution with sodium benzoate.

The vapour of ammonia is advantageous to some asthmatics, and cases are on record of persons, prone to these attacks, who have found an immunity from them when constantly exposed to an atmosphere containing ammonia, as in the air of stables.

The use of **emetics** for the relief of the asthmatic attack has been highly commended by some, and we have seen very great benefit follow the unexpected emetic action of a hypodermic injection of morphine; but in such cases there is usually a coexisting bronchial catarrh, and the emetic effect is attended with the discharge of much stringy, tenacious mucus.

In asthmatic children an emetic of 20 grains of ipecacuanha will sometimes be of use by emptying

an overloaded stomach, as well as by expelling catarrhal secretion from the air-passages.

In certain phases which asthmatics will sometimes present—such especially as the occurrence of almost continuous dyspnœa, with signs of dry catarrh, i.e. a good deal of irritating, hacking cough, and very little expectoration—we have found great benefit from the administration of small, nauseating doses of tartar emetic, together with small doses of morphia and potassium iodide.

The following we have found a useful prescription in such conditions :—

℞ Antimonii tartarati ... ... gr. j.
Liquoris morphinæ hydrochloridi... ... ℥ij.
Potassii iodidi ... ... gr. xl.
Spiritus chloroformi ... ... ℥ij.
Aquæ ... ... ad ℨiv.

Misce, fiat mistura. One tablespoonful, with one of hot water, every three or four hours until relieved.

The relief afforded by emetics often precedes vomiting, and coincides with the first sense of nausea and faintness. The emetic acts through its power of relieving muscular spasm.

Iodide of potassium is one of the most reliable of remedies for asthma, both during the paroxysms and in the intervals. It may be given in 5- to 15-grain doses twice or three times a day, and one of these doses should be given at bedtime. In old cases of bronchitic asthma it is a good plan to give a small dose of the extract of stramonium with the iodide of potassium. The following is a very good formula : —

℞ Potassii iodidi ... ... gr. v ad xv.
Extracti stramonii ... ... gr. ⅙ ad ⅓.
Spiritus chloroformi ... ... ♏xx.
Spiritus ammonii aromatici ... ... ♏xx.
Aquæ ... ... ad ℨjss.

Misce, fiat haustus.

This draught may be taken at bedtime only, or it may be taken more frequently, according to the requirements of the case. The extract of stramonium

is, however, often found a very uncertain drug. Different extracts seem to be of very unequal activity.

When the extract is good it usually gives rise, at first, to some unpleasant dryness of the throat and mouth, some disturbance of vision, and sometimes a little headache and loss of appetite. These effects worry some patients excessively, and they will often refuse to continue its use.

It is for these reasons that it is best to give the stramonium at night only, when its unpleasant effects can be to a great extent slept off.

Hare recommends a combination with very similar properties:

℞ Sodii iodidi ... ... gr. ij.
Potassii bromidi ... ... gr. ij.
Ext. euphorbiæ piluliferæ ... ... ♏iij.
Nitroglycerini ... ... gr. $\frac{1}{100}$.
Tincturæ lobeliæ ... ... ♏iv.
Fiat tabella vel capsula j. Take one to four three times a day.

Belladonna, when given alone, is not nearly so useful a remedy for asthma as stramonium. It is, however, commended in large doses ($\frac{1}{2}$ dram of the tincture) by some authors. It causes a most distressing sense of dryness in the throat, besides unpleasant disturbances of vision in many. Combined with other drugs it enters into the composition of many remedies for asthma, and we have already pointed out how useful its alkaloid atropine proves when combined with morphine.

Tucker's "Asthma Specific" is so largely used by the public, and, we must frankly admit, often with great relief to the asthmatic paroxysm, that we feel bound to draw attention to its composition. It is inhaled as a fine spray from a nebuliser.

An analysis, made by the *Lancet* analyst, of two samples of this remedy showed it to consist, the first sample, of 1·03 grains of cocaine per fluid ounce, 0·52 grains of atropine, and 16 grains of sodium nitrite. The second sample contained 1·47 grains of cocaine, 0·66 grains of atropine, and 24·46

grains of sodium nitrite. There was also a considerable amount of glycerine, balsams, and other unimportant constituents.

Some patients cannot take potassium iodide without suffering from lachrymation, frontal headache, and other signs of coryza; and in some it causes intense depression. In such cases you may give the bromide of potassium; and in some excitable, highly nervous subjects this salt has been found useful in keeping off the asthmatic paroxysm when given in 10-grain doses twice or three times a day.

The evidence as to the value of **lobelia** in relieving the asthmatic paroxysm is not altogether satisfactory. It is a very uncertain remedy, and it should not be had recourse to until more reliable remedies have failed. Besides its uncertainty, its effects are often very disagreeable, causing quite an alarming sense of faintness and sickness. Still, in the treatment of the paroxysm of asthma we must not altogether discard any resource which has been found efficacious by trustworthy observers, and some appear to value it highly. It should be given in small doses frequently (5 minims of the ethereal tincture every ten minutes until it produces some decided effect). As soon as nausea is experienced it should be stopped, and only repeated at intervals of four to five hours, supposing its effect is beneficial. By giving it in this tentative manner the dose appropriate to each individual will be ascertained. It is best suited to the treatment of the bronchitic form of asthma.

Grindelia, the fluid extract of the leaves of *Grindelia robusta*, in doses of 10 minims to 1 dram, has been highly extolled by some American physicians for the relief of spasmodic asthma. Bartholow says "few cases fail to be relieved at once."

Conium, in full doses, has been advocated for the relief of this, as well as of other spasmodic affections.

Hyoscine has also been found useful by some practitioners.

The **"triple" bromides** of potassium, sodium, and ammonium have been given frequently in cases of asthma. They are too slow in their action to be of much use in the treatment of the paroxysm, but they are certainly useful during the intervals, especially in highly neurotic subjects, and appear to diminish the frequency of the attacks. We should strongly recommend their employment on the first incidence of spasmodic asthma in young people.

Strychnine alone or, better, combined with *atropine*, in hypodermic injections, has been found very useful in keeping off the paroxysms. At first a daily dose of $\frac{1}{32}$ grain of strychnine and $\frac{1}{160}$ grain of atropine should be given, and this may be slowly increased to $\frac{1}{24}$ grain of strychnine and $\frac{1}{100}$ grain of atropine. If the amelioration is maintained these medicines should be discontinued. We have given with benefit the *arsenate of strychnia* in $\frac{1}{32}$-grain doses, three times a day, in pills with extract of valerian.

Another most valuable remedy in the treatment of asthma, especially the bronchitic and also the gouty forms, is **arsenic.** We have frequently obtained most excellent results from the long-continued administration of this drug. The following is a good formula :—

℞ Liquoris arsenicalis ... ... ♏xxxvj.
Spiritus ammoniæ aromatici ... ... ℥iv.
Spiritus chloroformi ... ... ℥ij.
Aquæ camphoræ ... ... ad ℥vj.

Misce, fiat mistura. One tablespoonful three times a day, in water, an hour after food.

Another convenient mode of giving arsenic in the intervals between the attacks is in pills of sodium arsenate and nux vomica :—

℞ Sodii arsenatis ... ... gr. jss.
Extracti nucis vomicæ ... ... gr. xxiv.

Misce et divide in pilulas xxiv. One twice a day, an hour after food.

At the same time 4 to 6 ounces of Bourboule water, which contains arsenate of soda, should be drunk *warm* night and morning.

In some conditions of asthma, associated with chronic bronchitis, one factor in the persistence of bronchial irritability is sometimes **microbial agency.** The streptococcus maximus, the pneumococcus, micrococcus catarrhalis, bacillus influenzæ, Friedländer's bacillus, and others have all been identified in this connection. In such cases an autogenous vaccine should be prepared and used. At present but a limited amount of success has attended the vaccine treatment of asthma, yet it is sufficient to warrant a more extended trial.

It has been suggested that the asthmatic paroxysm is frequently dependent on disease of the **nasal** and **pharyngeal** cavities, such as the presence of polypi or hypertrophic and catarrhal conditions, or other morbid states, and that more attention should be given to the investigation of these cavities in considering the etiology and treatment of asthma. The removal of adenoids and polypi and the radical treatment of diseased conditions of the nasal and pharyngeal cavities have occasionally been attended by disappearance of asthmatic attacks. If any areas of hyperæsthesia are detected in the nasal mucous membrane by means of the probe, the effect of rendering them anæsthetic by cocaine should be tried, and if improvement results, they may be subsequently touched with the galvano-cautery. Some laryngologists assert that areas of this kind are to be found in every case of asthma, and almost guarantee a cure by the cautery. We have seen brilliant results in a few cases, but in our experience such results are exceptional.

In all cases, and especially those occurring in children and young people, the nasal fossæ should be thoroughly explored, as well as the throat; enlargement of glandular and other structures of the throat and neck by compressing the vagus or its branches

may be concerned in the production of the asthmatic paroxysm ; the possibility also of enlarged bronchial glands acting as a source of irritation must not be overlooked, especially when asthmatic attacks follow acute infective diseases attended with much bronchial catarrh, as measles, etc. The remarkable curative effects of the iodides and of arsenic in many cases of asthma suggest the possibility of these drugs acting through their well-known influence over glandular inflammation and hypertrophy.

We believe we were almost the first to call attention in England to the success which had attended the application of the **induced electric current** along the course of the vagus in the neck in some cases of asthma. This mode of treatment had at that time been strongly advocated by Dr. Max Schäffer, of Bremen. The idea was that the source of irritation in some cases could be traced to swelling of the laryngeal, pharyngeal, or nasal mucous membrane, causing pressure in the neck on the vagus or other nerves in connection with the respiratory tract. The current must be of good strength so that it can be felt as passing through the soft palate from one side of the throat to the other. It should be applied to the throat in the situation of the great nerve trunks, the vagus and sympathetic, each pole being applied just below the angle of the jaw, and in front of the sterno-mastoid.

With regard to the **pneumatic treatment** of asthma, either by the portable apparatus or in the Pneumatic Chamber, it is clear that these methods are not applicable, or very rarely so, to the relief of the severe asthmatic paroxysms. These often occur suddenly, and at times and in places when it would be out of the question to apply treatment of this kind. Waldenburg, however, maintains that he has cut short the less violent paroxysms of asthma by the inspiration of compressed air.

But it is in the intervals between the attacks, and especially in the catarrhal form of asthma, that most may be expected from pneumatic treatment, in re-

moving or lessening the emphysema which invariably develops after a series of quickly recurring attacks, and in relieving the chronic catarrhal condition of the bronchial mucous membrane. Alternate inspiration of compressed air with expiration into rarefied air is therefore valuable in the intervals, leading to improvement in the emphysema and to a prolongation of the intervals between the paroxysms. In some cases it is useful to combine warm aqueous vapour, impregnated with ammonium chloride, with inspiration of compressed air.

Treatment in the Pneumatic Chamber is chiefly directed to produce an anti-catarrhal effect, and is, therefore, far more useful, as we have said, in the *catarrhal* than in the *nervous* form of asthma.

Inhalations of oxygen have been advocated for the relief of the asthmatic paroxysms; there can be no objection to trying this expedient, but we have not found it so useful in the severe paroxysms of nervous asthma as in the more continuous dyspnœa of the bronchial form; in these cases, and especially during the intervals of rapidly recurring attacks, it has seemed to be of much benefit and comfort to patients.

Inhalation of medicated vapour is extensively used at several spas in the treatment of persistent asthma.

One of the most interesting and successful methods of treating bronchial asthma is that carried out during the summer months at Mont Dore, in Auvergne, which we have described at length elsewhere.* The presence of a trace of arsenic in the vapour of the water is regarded as an important agent in the cure. Similar treatment is employed at Allevard-les-Bains, Eaux Bonnes, Cauterets, and Harrogate (all sulphuretted hydrogen and other waters).

Having reviewed most of the remedies that have been employed in the treatment of asthma, both

* See the author's "Therapeutics of Mineral Springs and Climates."

during the paroxysm and in the intervals, we are now in a better position to consider its **pathology.**

After a careful consideration of all the arguments that have been adduced against the nervous theory of asthma, the more we see of cases of asthma the more impossible it seems to us to resist the conviction that there is a nervous element in every case, and that in very many the nervous element is altogether the predominant one. Let us illustrate this remark by reference to a case of so-called "renal" asthma not dependent on pulmonary œdema. Here we have blood contamination as an obvious cause of the nervous disturbance, and the chain of phenomena is tolerably complete. A patient, towards the closing scenes of Bright's disease, with contracted gouty kidney, and hypertrophied heart and thickened arteries, gets sudden attacks of alarming dyspnœa, arising apparently without any cause, sometimes when sitting tranquilly by his fireside after dinner, sometimes in the middle of the night, or at any other time. He has no cough, no moist râles, but expiration is difficult and prolonged, just as in the usual form of asthma; moreover, if you let him inhale chloroform vapour, the paroxysm of dyspnœa disappears. Now, it would seem that in such a case either we have a uræmic irritation of the respiratory centre setting up a sort of convulsion of the bronchial muscles, a sort of pulmonary epilepsy; or we may have a reflex excitement of the bronchial spasm in the following manner: an unusual proportion of the retained urinary excrement is being eliminated at the respiratory surface, and this irritates the peripheral terminations of the respiratory nerves, and so excites in a reflex manner contraction of the bronchial muscles. The urinous odour in the breath is always very marked in these cases.

An explanation which holds good with regard to these renal cases of spasmodic asthma will hold good with regard to others in which the original disturbing cause is not so manifest. The nervous irritation

may be central, or it may be peripheral. A certain inherited vulnerability or excitability (hyperæsthesia) of portions of the central or peripheral nervous system doubtless exists in certain persons. When it is the respiratory centre or the respiratory peripheral nerves which are thus affected, we encounter the phenomenon of spasmodic asthma, occurring from causes of irritation sometimes so slight and evanescent as entirely to escape discovery.

But there is another possible view of the mode of action of the "nervous element" in asthma. I allude to the view put forward by Weber. He maintains that, "for many forms of asthma, the existence must be admitted of a tumefaction of the bronchial mucous membrane in consequence of dilatation of its blood-vessels through vaso-motor nervous influences." Those attacks of asthma which are observed to alternate with attacks of urticaria, and in some of which patches of swollen mucous membrane have been actually observed in the pharynx, would fall under this head. In commenting on this view, Riegel observes: "We may suppose that whenever an irritation affects the bronchial mucous membrane, this irritation may excite vascular turgescence in this region; that the acute tumefaction of the mucous membrane of the bronchioles is the primary element in asthma may explain the milder attacks, but not the severe forms, where a second factor (muscular) must be associated; how otherwise shall we explain the frequently observed 'rapid amelioration after chloral hydrate, and like remedies'?" and he concludes that asthma is a "spasm of the bronchial muscles with simultaneous congestion of the bronchial mucous membrane."

But it must be admitted that the majority of cases of asthma are associated with, and often complications of, a pre-existing bronchial catarrh. In these cases, however, there is always a nervous element upon which the spasmodic paroxysmal nature of the attack depends. In the first place, the subjects of purely spasmodic

asthma may, and do often, become simultaneously the subjects of bronchial catarrh. There is every reason why they should, possessing, as they do, a hypersensitive respiratory surface. But there yet remain a considerable number of cases in which the bronchial catarrh certainly appears to be the exciting cause of the asthma. Now, such patients may be considered to suffer from hyperæsthesia of the bronchial membrane, just as others suffer from cutaneous hyperæsthesia, and in them the presence of tenacious, thick mucus in the finer air-passages acts as an irritant, and produces that amount of muscular spasm which is sufficient to give rise to a paroxysm of asthma. Thus it can be shown that in every case of asthma there is a nervous element; but in some cases the nervous state is the only one that needs to be dealt with therapeutically, while in others, where the bronchial irritation depends on the presence of a catarrhal state, the removal of this catarrhal condition must be the basis of any successful medication.

The many practical illustrations of its neurotic character that must occur to everyone who has seen much of asthma seem to us overwhelming. We will allude to a few only; and first to the frequently observed alternation of attacks of asthma with other neurotic affections, as migraine, angina, hysteria, and certain cutaneous diseases.

It must have occurred to many how very rare it is to see a purely asthmatic paroxysm in the wards of a hospital; yet cardiac diseases and advanced emphysema and bronchial catarrhs are excessively common. If asthma were simply a catarrhal disorder, as some have maintained, its manifestation would be frequent instead of rare in our hospitals.

We have shown the remarkable influence of sedative and antispasmodic remedies in the relief of the asthmatic paroxysm. Numerous other considerations occur to us in support of the neurotic character of asthma; but they seem to be scarcely needed in order to establish a position already so strong.

We have already reviewed most of the remedial measures proposed for the treatment of asthma, both during the paroxysm and in the intervals; it will be found that, numerous as these remedies are, one cannot have too many resources in dealing with so capricious a disease as this is, and that remedies that will be most efficient with one individual will fail with another, or will be unable to be persevered with on account of some disagreeable collateral effects. If we had to select a limited number of these remedies to which we were to be restricted, we should choose the following: *morphine* with *atropine; chloroform;* the *nitrites; fumigations* with *nitre* and *stramonium; stramonium; caffeine; iodide of potassium*, and *arsenic*. Cases which occur in the "gouty," and are associated with defective elimination, are especially benefited by potassium iodide in combination with an alkaline carbonate; they require also a mercurial purge from time to time, combined with small doses of colchicum. The treatment, in short, must be, to some extent, directed to the gouty constitution, and sedatives and opiates, as far as possible, must be avoided. Cases associated with chronic bronchial catarrh and emphysema will, of course, not be relieved so long as the bronchial catarrh remains uncured, and our remedies must be directed to curing the catarrhal condition according to the principles laid down in the last chapter. All physicians are agreed as to the utility of free action of the bowels in warding off a threatened attack. A dose of calomel will, in this way, often be of service. Large doses of alcohol have been commended by some, but we should hesitate about prescribing these, as we think there is some danger of establishing an alcoholic habit, and this would certainly favour pulmonary degeneration and emphysema.

It is necessary to add a word of caution in regard to the free and excessive use of stramonium and similar fumigations. The general health is often greatly disordered thereby, and their employment

should be, as far as possible, restricted to the relief of the more severe paroxysms.

We have still a few remarks to make on the subject of the climatic, dietetic, and hygienic management generally of the asthmatic.

As to the **climatic** and atmospheric conditions which are favourable to the cure of asthma, it has generally been taught that patients should be removed to a place which presents the precisely opposite conditions to those that prevail in the locality where the asthma has attacked them, and it has been especially insisted upon that the densely populated, smoky, and stuffy districts of large cities are the most suitable for the relief or prevention of spasmodic asthma. Unquestionably, many cases have been noted by competent observers in which disappearance of the asthmatic paroxysms had attended the removal of the patient to crowded cities; and it is, perhaps, rather a curious circumstance how few sufferers from spasmodic asthma are found amongst the population of the poorest districts of London.

But we are disposed to think that too much has been made of this, and our own experience would point to more numerous instances of the cure of asthma by removal to what might be called *anti-catarrhal* districts; and if it is true, as has been stated, that 80 per cent. of all cases of asthma are complicated with bronchial catarrh, this result might be anticipated. It is the purely nervous cases that are so capricious with regard to climate and atmospheric conditions; and this capriciousness will be observable even in the case of seaside resorts in close proximity to one another. We have known a patient leave London, on account of asthma, for Deal, and on reaching this place find his asthma worse than in London, but on moving a few miles along the coast to Folkestone his asthma left him immediately. Nervous cases, or cases in which there is a strong nervous element, especially in young people, will

often do well in high altitudes, as in the Engadine, and a few catarrhal cases also, in the young and vigorous, will do well in such localities if they encounter a fine season, but in bad seasons they are sometimes injuriously affected. Cases complicated with chronic bronchial catarrh and emphysema should never be sent to these elevated resorts.

Cases in which bronchial catarrh has been the exciting cause of asthma will, some of them, recover completely at Madeira. They leave England feeble invalids, and we have seen them return robust and well. It is as well, however, when they are in a position to do so, that they should return to Madeira for a few months, for three or four successive winters —from December to May. The Canaries offer an alternative resort. At Arcachon, Biarritz, Pau, and Amélie-les-Bains we have found asthmatic patients do well in winter. We have known some very bad cases of patients who have avoided returning to England by passing the winter at Pau and the summer at Bagnères de Bigorre. The Riviera resorts cannot be relied on in asthmatic cases, but some asthmatic patients have done remarkably well at Grasse and at Cimiez. Some of the emphysematous and catarrhal asthmatics obtain advantage in the summer from moderate elevations like Montreux or Glion, Lugano, Aussee, Reichenhall, and Meran; in the last two places they can have the advantage of well-arranged pneumatic treatment.

In England we have known the climate of Folkestone and Eastbourne, in the summer, to be very useful to some cases, and that of Bournemouth, Ventnor, and Hastings in the winter. The pine district around Woking, Weybridge, and Ascot has also been of service in numerous instances.

Bronchitic patients should be warmly clad, should avoid all causes of catarrh, and should live in well-warmed, suitably ventilated apartments, and should not be allowed to sleep in cold bedrooms. It is worth noting that the asthmatic paroxysm often occurs

during the coldest part of the night, viz. between 2 and 4 a.m. We know many sensitive persons who at once wake up in the night if there is a fall of temperature, and it is quite conceivable that, if an asthmatic woke up in such circumstances, he would wake up with an attack of asthma. Suitable *gymnastic exercises* have been found useful in keeping off attacks in children. Exercise in the open air (not fatiguing exercise), and cold sponging, when it can be borne, followed by friction with a rough towel, are good hygienic measures for removing undue sensitiveness of the surface.

As asthmatic paroxysms are often induced by **digestive disturbances** it is of the highest importance to see to the proper regulation of the diet and meals of an asthmatic patient, in the intervals between the attacks. All indigestible articles of food should be avoided, but especially those which he has learnt by experience are prone to induce a paroxysm. Suppers and late dinners are to be forbidden, and the principal meal should be taken in the middle of the day.

The adoption of a vegetarian dietary has been found of value in some cases. But in each case the diet that is most suitable can only be ascertained by watchful observation. We have known patients who remained well only so long as they adhered to a diet in which there was little else but proteid food.

Tendencies to constipation and flatulence should be guarded against by some suitable aperient. An aloes and ipecacuanha pill after dinner is the best in many cases; and an occasional dose of Carlsbad salts may be added. Gouty asthmatics frequently derive great relief from 2 grains of blue pill, taken regularly once or twice each week. Any disorder of the female sexual organs must, of course, be remedied.

All depressing emotions should be avoided; but pleasurable ones sometimes have the effect of dissipating the attack.

Hay Fever, or Hay Asthma

This malady is also known by other names, as "rose cold," "catarrhus æstivus," "coryza vasomotoria," and "rhinitis hyperæsthetica."

It may occur in either of two forms—the *catarrhal* or the *asthmatic*.

The first form resembles an acute coryza, coming on with sudden irritation of the nasal, conjunctival, and pharyngeal mucous membranes, and attended with distressing sneezing. The asthmatic form usually comes on a week or so after the catarrhal form; but the asthmatic symptoms may also develop early. Often on the appearance of the asthmatic symptoms the nasal symptoms cease.

The cause of these paroxysmal attacks is threefold: (1) The contact or influence of an *external irritant*, acting (2) on an *hyperæsthetic* mucous membrane in (3) persons of a *neurotic* or gouty constitution.

The most common external irritant is the pollen of certain grasses (hence the name "hay fever") and of other plants. The existence of these irritating agents in the air at certain seasons accounts for the fact that in Europe this disease is especially prevalent in the spring, while in America it is most common in autumn, i.e. from the middle of August to the latter part of September.

In this country the pollen of several of the grass family has been proved to be capable of exciting this disease, but in America the pollen of *Ambrosiæ artemisiæ folia* (rag-weed) and that of *Solidago odora* (golden-rod) have been especially implicated. The odours of roses and other sweet-smelling plants have the same effect on certain persons. Various powders, other than pollen, such as ipecacuanha and lycopodium, have been found to give rise to similar symptoms.

It is, however, certain that the pollen of plants is the principal exciting cause of hay fever.

It has been asserted that in many persons prone to this malady the nasal mucous membrane is diseased (*hypertrophic rhinitis*), and is excessively sensitive, so that the merest touch with a probe will bring on an attack. Others, however, maintain that there is no essential connection between the two.

The symptoms complained of in the catarrhal form are those of an intense coryza, viz. distressing irritation and congestion, with excessive secretion from the eyes, nose, and upper air-passages, usually attended with frontal headache, more or less cough, violent sneezing, and considerable depression of spirits.

In the asthmatic form we encounter the symptoms of bronchial asthma, which may follow the preceding or alternate with them.

In many sufferers there is a liability to a return of the malady annually at the same date, which will, however, be found to vary with the seasons, according as they are early or late.

Many authorities consider the gouty constitution an important predisposing influence in the development of this disease.

In the etiology of the affection we have thus to admit: (1) an external irritant; (2) local hypersensitiveness; and (3) a constitutional tendency—neurotic or gouty, or both combined.

The **indications for treatment** are, like the causation, threefold:—

1. To avoid or suppress the local irritant.
2. To diminish the local sensitiveness and relieve the local congestion.
3. To modify the predisposing constitutional state.

1. The surest means of avoiding the local irritant is, when practicable, **a change of residence.** If the sufferer from hay fever could always live on the sea during that period of the year when the pollen of grasses and other plants is carried by winds into the air he has to breathe, he would escape the attacks. Removal also to places on the sea-coast which are

situated at a distance from cultivated land and vegetation is almost as good. High altitudes, where the land is not cultivated, will answer as well. In America the White Mountains of New Hampshire are a favourite resort.

Much, however, may be done to avoid the irritant cause by those who may not be in a position to avail themselves of change of residence. They must avoid cultivated districts, fields, woods, and gardens, when the grasses are flowering. They must avoid exposure to the open air during high winds, when dust may be blown about and enter their air-passages; exposure to bright sunshine is irritating, and travelling by rail, by motor or bicycle, on horseback, or in an open carriage, are all to be avoided because of the exposure to dust which attends such means of locomotion. Large, dark spectacles, fitting close to the orbits; broad-brimmed hats to keep off the sun's rays, thick gauze veils, are all useful protections and preventives.

2. A vast number of **local applications** have been suggested and tried for relief of the sensitiveness, congestion, and irritation. One of the simplest is the application of an oily spray to the nasal mucous membrane, such as liquid *vaseline* or *albolene*, containing about 5 per cent. of menthol dissolved in it. This can be applied by a special pulveriser for spraying oily fluids. It covers the mucous membrane with a sort of protective varnish, which shields it from external irritants or lessens their irritating effects. The menthol, at the same time, acts as an antiseptic, and also allays existing irritation. Great relief has been experienced from a spray of *cod-liver oil* (the *deodorised* oil is used) applied to the nostrils by means of a hard rubber atomiser every three hours, or oftener if necessary.

Various *antiseptic* applications have been recommended and found serviceable, viz. carbolic acid in strong solution, applied by a brush to the sensitive areas, previously anæsthetised by cocaine; a solution of perchloride of mercury, 1 in 3,000; a combina-

tion of these with quinine (bichloride of mercury 2 grains, hydrochloride of quinine 30 grains, and glycerine of carbolic acid 1 ounce). Resorcin (after removal of any diseased condition of the nasal mucous membrane) has been stated to give excellent results; it has been prescribed as follows: Resorcin 1½ grains, sodii chloridi 4 grains, acidi aceti 2 minims, water to 1 ounce. This should be applied frequently.

Protargol, a non-irritating silver salt, has been used in Professor Fränkel's clinic in Berlin. A ½ per cent. solution is used at first, and stronger ones subsequently, if they cause no irritation. They are applied with a sort of massage to the nasal mucous membrane. It is recommended to commence this treatment as a preventive three or four weeks before the expected attack.

Hydrozone, a preparation of hydrogen peroxide, 1 to 12 ounces of sterilised water, has also been used successfully as a preventive. It is applied as a douche, tepid or cold, four times a day for a fortnight before the period of the attack—its strength being gradually increased.

Cocaine has been very largely employed in this affection, alone, or in combination with some of the preceding, as an anæsthetic. Latterly the dangers attending the use of this drug have been much emphasised, and perhaps a little exaggerated.

Apart from the risk of exciting the cocaine habit, it is urged that there is danger of reaction after its use, and the production of local paresis of vessels.

It is undoubtedly a useful palliative—it has been applied in a 2 per cent. solution, with a small spray producer, with great relief to symptoms, using about ½ grain (25 minims) at a time, and spraying the eyes lightly at the same time, with lids half closed.

A solution of *adrenalin chloride* has been used as a local application—1 in 5,000. A stronger solution has also been used up to 1 in 1,000, combined with 2 per cent. of *chloretone*, as an anæsthetic and preservative. It is said to "reduce the extreme engorge-

ment of the turbinal tissues, and allay the intense irritation." It has also been used in combination with cocaine. It has been said with regard to this combination, "These remedies are extremely dangerous. The relief experienced is temporary and is quickly followed by return of the symptoms in an aggravated form" (Lambert Lack).

Tucker's asthma cure, of which we have spoken in the previous section (p. 622), is extensively employed by the public for the relief of hay asthma.

Atropine (or belladonna) and *morphine* (or opium) have been given, together and separately, to relieve the distressing symptoms; and this they do as in ordinary attacks of coryza. One authority has given as much as $\frac{1}{25}$ grain of atropine daily; but such remedies can only be palliative, and they are attended, when given in full doses, by very disturbing effects of their own, and in our opinion should only be employed very occasionally, and in moderate doses, and at the onset of attacks, to allay severe and distressing symptoms.

The distressing *itching of the conjunctivæ* has been benefited by lotions of borax or boric acid dissolved in camphor water, 10 grains to the ounce.

Surgical operative measures commend themselves greatly to many specialists, and they are doubtless needful in certain forms in which local disease exists in the nasal cavities. "The removal of nasal polypi, or any spur from the septum that impinges upon the outer wall, linear cauterisation along any hypertrophied or tumefied turbinated bodies, and, most important of all, the superficial cauterisation of all places found to be extremely sensitive," are the measures to be carried out.

The galvano-cautery is generally used for these cauterisations as by far the most satisfactory.

The operations are recommended to be done not during the attack, but in the free months preceding it.

Some specialists carry operative measures to the

extent of removing the inferior and middle turbinated bones!

3. As to **general constitutional treatment.** In the neurotic, nerve tonics, such as preparations of phosphorus, arsenic, and strychnine, are indicated.

Valerianate of zinc has been found useful in such cases by many practitioners—2 or 3 grains three times a day may be given. A combination of sodium bromide and infusion of valerian has also been found serviceable. When obvious debility accompanies neurasthenia, preparations of iron, quinine (the hydrobromide), and cod-liver oil may prove useful, especially in helping to ward off expected attacks.

Pollantin, or "Dunbar's serum," has recently been introduced as a specific treatment for hay fever. It is an antitoxic serum, and is patented. It is the serum of horses inoculated with the pollen toxin. It is prepared and sold in two forms, "*Pollantinum liquidum*," a liquid, and "*Pollantinum pulverisatum*," a powder (Schimmel & Co., Leipzig). They are intended for application, by inhalation or insufflation, to the mucous membrane of the nose, eye, or pharynx, not for hypodermic injection. "Pollantin acts mainly as a prophylactic, and is of little use if applied after the catarrh is fully developed" (Bulloch). It has been reported that out of 792 cases in which pollantin was tried, 61·7 per cent. were greatly benefited, in 27·9 per cent. partial benefit was experienced, and in 10·4 per cent. no effect was observed. In spite of these encouraging figures we have not ourselves observed any diminution in the number of sufferers from hay fever. Full instructions as to the manner of application are furnished with the pollantin, and these must be strictly adhered to. (Willows, Francis, Butler & Thompson, 40, Aldersgate Street, are the London agents.)

In the gouty and dyspeptic, alkaline mineral waters have been found of benefit, combined with aperients containing a little colchicum or some other hepatic stimulant.

Pulmonary Emphysema

We are unable here to enter upon the consideration of the many interesting questions that are concerned in the discussion of the pathology and etiology of pulmonary emphysema, and we can only refer, very briefly, to those points which have an essential bearing on the indications for treatment.

Pulmonary emphysema was correctly and briefly defined by Laennec as "an excessive, permanent, and abnormal distension of the air-cells." This, of course, applies to "*vesicular*" emphysema, for "*interlobular*" emphysema—i.e. the passage of air into the connective tissue between the lobules of the lung—does not here concern us, as it is a condition practically removed from effective treatment. We may generalise the **causes** of vesicular emphysema by saying that it is either due to excessive strain on the interior of the normal air-cells, whereby they lose more or less of their elasticity and become dilated, as in violent inspiratory and expiratory efforts, and especially the latter; or it is determined by degenerative and atrophic changes in the walls of the air-cells themselves, by which they lose their normal resisting power; or the two conditions may, to some extent, be co-operative. It has also been referred to congenital weakness of the elastic tissue of the lungs.

We encounter pulmonary emphysema in various degrees, sometimes very slightly developed and sometimes in a very advanced stage; sometimes partial—i.e. affecting only certain portions of one or both lungs—and sometimes general. The partial forms are often what is termed "compensatory"—i.e. a dilatation of certain groups of air-cells to take the place of others that are collapsed or for some cause or other rendered ineffective. These "compensatory" forms are often rather conservative than injurious, and partake of the nature of compensatory hypertrophy, and do not therefore concern us here.

The effects of emphysema are felt both in the

heart and the lungs: the right heart has more work to do, and is less well nourished to do it: and the lungs not only suffer in loss of respiratory area, but also in their essential elasticity.

One of the chief **indications for treatment** in this disease is to prevent slight cases becoming severe ones, by withdrawing the patient from the influence of those conditions which produce it. The early stages of emphysematous dilatation of the air-cells very commonly arise from the strain of athletic exercises during the period of growth and development, especially in comparatively feeble organisations. On examining the chests of youths who have submitted themselves to strain of this kind, it will be found that the inspiratory expansion is very limited, the excursion of the chest in passing from the forced expiratory to the forced inspiratory position often not exceeding an inch or an inch and a quarter. This is often overlooked, and the subjects of it are not cautioned, as they should be, against pursuing sports or exercises for which they are unsuited, and which lead in course of time to both pulmonary and cardiac strain.

As this disease very frequently originates in and becomes aggravated by repeated attacks of bronchial catarrh and the paroxysms of coughing which accompany them, the prophylactic indication points also to the removal of such patients from the predisposing and exciting causes of such attacks, especially removal in winter to a more congenial and anti-catarrhal climate, if the patient's means admit of this. Emphysema frequently has its origin in severe and protracted attacks of whooping-cough in early life, a disease which we shall hope to show is much more amenable to rational treatment than is generally recognised.

Asthma is a disease which usually, in course of time, leads to the production of emphysema of a severe form. When emphysema is a complication of asthma, or is associated, as it so constantly is, with

chronic bronchial catarrh, the indications for treatment, both prophylactic and remedial, must be sought to a great extent in what we have said of the management of those diseases.

The avoidance of all physical *strain*, and the strict limitation of physical exercises to such as are gentle and in no degree excessive, and the protection of the patient from all causes of catarrhal attacks, are the chief indications in the treatment of emphysema, and for preventing the slighter degrees from advancing into the more serious forms.

There is little in the way of remedial measures that can be directly applied to the dilated and atrophied lung tissue, to the recovery of the lost elasticity of the air-cells, or to the restoration of the obliterated capillaries in their walls. Arsenic and iodide of potassium have both been credited with the power of retarding degenerative changes, and both are of use in the treatment of catarrhal and dyspnœic states, as we have already shown. When emphysema is associated with an acute catarrhal condition of the air-passages, whatever can free the air-passages from the secretions obstructing them by promoting expectoration will, of course, be beneficial. For this purpose saline, alkaline, and ipecacuanha sprays have been applied and found useful.

Free evacuation of the bowels, and measures to relieve any flatulent distension, are very needful in cases of emphysema to take off from the diaphragm any pressure from below, and to allow it to descend as freely as possible. With this view also the food should be concentrated, nourishing, and not bulky.

If we apply ourselves to dealing with the emphysematous condition of the lungs apart from coexisting catarrhal states, our chief resource must be those tonic and hygienic measures that are calculated to improve the general nutrition—air, climate, food, exercise, and tonic medicines, such as iron, arsenic, strychnine, cod-liver oil—selected and adapted to individual cases and on general principles. We must remember that

we have, in all advanced cases, a state of dilatation of the right side of the heart to deal with, which will also be benefited by this general tonic treatment.

We are not disposed to attach great importance to **climatic treatment** in pulmonary emphysema, except in those cases in which the condition is associated with bronchial catarrh. For a full consideration of the climates suitable for such patients, reference should be made to the chapter on Chronic Bronchitis (p. 604).

Attempts have been made to remedy the pulmonary condition, and to improve the respiratory functions in emphysematous cases, either by causing them to breathe compressed air in the Pneumatic Chamber,* or by means of a portable apparatus to inspire compressed air and expire into rarefied air. Great relief to the dyspnœa such patients suffer from is often experienced from expiration into rarefied air. The suction action exerted on the air in the lungs leads to more complete pulmonary ventilation, to the removal of stagnant air in the air-cells, and to the free entrance of fresh air. The physical signs also often show a marked improvement in the condition of the lungs. When there is coexisting bronchial catarrh it is necessary to precede the expiration into rarefied air by inspiration of compressed air, else irritative cough is excited.

Treatment in the compressed-air chamber has also been attended with good results in not too advanced cases, and it is especially applicable to cases complicated with chronic bronchial catarrh, which it relieves. At Kissingen the compressed-air chamber is constructed large enough to hold several patients at the same time. At Reichenhall, in Bavaria, inhalation of the saline spray is combined with treatment in the Pneumatic Chamber. How this method acts has been the subject of much discussion; it probably increases the flow of blood through the lung, and so improves its nutrition.

* *See* "Aerotherapeutics," by C. T. Williams, M.D. 1894.

In advanced cases with threatened cardiac failure from dilatation of the right side of the heart, and with general venous engorgement, cardiac tonics are needed, and the appropriate treatment will be precisely the same as that which is adapted to cardiac asthenia and the chain of morbid phenomena connected therewith. (*See* under Chronic Bronchial Catarrh, Chap. XXV., *and* Cardiac Dilatation, Chap. XVIII.)

ADDITIONAL FORMULÆ

For the non-paroxysmal dyspnœa of asthmatics

℞ Chloral hydratis, ʒij.
Ammonii chloridi, gr. lxxv.
Morphinæ hydrochl., gr. jss.
Antimonii tartarati, gr. j.
Grindeliæ robustæ fluidi extracti, ʒvj.
Syrupi glycyrrhizæ, ʒj.
Aquæ ad ʒiij.
M. f. mist. A teaspoonful in water every three to six hours. (*N. S. Davis.*)

Or

℞ Chloral, ʒv.
Sodii nitritis, gr. xlv.
Tincturæ stramonii, ʒijss.
Syrupi simplicis ad ʒiij.
M. f. mist. A teaspoonful in water every four hours. (*N. S. Davis.*)

Mixture in bronchial asthma

℞ Extracti quebracho, ʒj.
Morphinæ hydrochl., gr. ss.
Syrupi simplicis, ʒv.
Aquæ mellissæ ad ʒiv.
M. f. mist. A tablespoonful every two or three hours. (*Bamberger.*)

Another

℞ Chloral hydratis } āā gr. xx.
Potassii iodidi }
Syrupi simplicis, ʒss.
Aquæ, ʒiv.
M. f. mist. A fourth part every two to four hours. (*Schnitzler.*)

Anti-asthmatic mixture

℞ Potassii iodidi, ʒij.
Liquoris Fowleri, ʒj.
Vini ipecacuanhæ, ʒiv.
Tincturæ hyoscyami, ʒiv.
Aquæ chloroformi ad ʒviij.
M. f. mist. A tablespoonful three times a day in water after food. (*Whitla.*)

Lobelia mixture for the asthmatic paroxysm

℞ Tincturæ lobeliæ, ʒj.
Ammonii iodidi, ʒij.
Ammonii bromidi, ʒiij.
Syrupi tolutani, ʒij.
M. f. mist. A teaspoonful every one, two, three, or four hours. (*Bartholow.*)

Mixture for asthma

℞ Tincturæ lobeliæ, ʒvj.
Potassii iodidi, ʒij.
Tincturæ camphoræ compositæ, ʒvj.
Decocti senegæ ad ʒvj.
M. f. mist. A tablespoonful for a dose. (*Green.*)

Bromide and iodide mixture for spasmodic asthma

℞ Potassii bromidi, ʒj.
Potassii iodidi, ʒss.
Aquæ ad ʒiv.
M. f. mist. A teaspoonful in sufficient water every half-hour or hour.

Another

℞ Extracti grindeliæ fluidi, ʒij.
Extracti lobeliæ fluidi, ʒj.
Extracti belladonnæ fluidi, ʒss.
Potassii iodidi, ʒjss.
Glycerini, ℥jss.
M. f. mist. A teaspoonful for a dose. (*Bartholow.*)

Pills for nervous asthma

℞ Sodii iodidi, ʒjss.
Pulveris et extracti glycyrrhizæ, ʒj.
M. et divide in pil. lx. Five to eight to be taken twice a day. (*Benedikt.*)

Powder for fumigation

Stramonium leaves, 4 drams.
Green tea, 4 drams.
Lobeliæ, 1½ drams.
Mix and pour on the mixture enough saturated solution of nitre to wet it. Dry it, and preserve in a closely stoppered bottle. (*Plant.*)

Another

Stramonium leaves, coarsely powdered, 2 oz.
Anise fruit, powdered, 1 oz.
Nitre, powdered, 1 oz.
Mix. A little of this to be placed on a plate and ignited. (*Sawyer.*)

Another

Datura tatula, 2 drams.
Stramonium leaves, 2 drams.
Cannabis indica, 2 drams.
Powdered nitre, 2 oz.
Oil of eucalyptus, ½ dram.
Mix thoroughly. Put a teaspoonful on white paper in a saucer, and burn in bedroom.
(*Warmly recommended by Dr. Woodward, of Worcester.*)

Another

Stramonium leaves, 1 oz.
Lobelia, ½ oz.
Belladonna, ½ oz.
(Grind thoroughly in a mill.)
Nitre, powdered, ½ oz.
Laudanum, ½ oz.

Dissolve the nitre in the smallest possible quantity of hot water, and add the laudanum; with this thoroughly saturate the minced and ground leaves, and dry at a gentle heat. When dry, mix well with powdered camphor and keep in a stoppered bottle. (*S. B.*)

It should be remembered that the excessive use of these fumigations has been observed to be attended with serious disturbance of the general health.

Mixture for catarrhal asthma

℞ Vini ipecacuanhæ, ʒj.
Tincturæ lobeliæ æthereæ, ʒjss.
Misturæ ammoniaci, ℥iij.
Aquæ ad ℥vj.
M. f. mist. Two tablespoonfuls for a dose.
(*Royal Chest Hospital.*)

Ointment for hay-fever

℞ Menthol, gr. xx.
Acidi carbolici, gr. x.
Olei olivæ, ʒij.
Ung. zinci oxidi, ℥ss.
M. f. ung. To be painted on the nasal mucous membrane.
(*StClair Thomson.*)

CHAPTER XXVII

TREATMENT OF PNEUMONIAS

ACUTE LOBAR PNEUMONIA: Symptoms, Physical Signs, and Anatomical Lesions—Etiology—Pneumonia a Specific Infective Fever—Influence of Chill—Climatic and Atmospheric Influences—Predisposing Causes—Relation to the Pneumococcus and other Micro-organisms—Transmissibility—Prophylaxis—*Indications for Treatment*—Open-air Treatment — Serum Treatment — Vaccine-therapy — The Expectant Method — Quinine — Mode of employing it — Formulæ—Temperature Charts—Aconite — Antiseptic Agents — *Treatment of Symptoms*—Pyrexia and Hyperpyrexia—Cold Baths —Varying Opinions — Ice-cradle — Cold Sponging — Local Applications of Cold — Ice-bags — Antipyrin — Phenacetin — Sodium Salicylate — Pain — Leeches, etc.— Dyspnœa — Blood-letting —Strychnine by Hypodermic Injection—Pituitrin—Oxygen Inhalations—Dry-cupping—*Treatment of the Tendency to Cardiac Failure* — Food — Water — Alcoholic Stimulants—Hypodermic Injections of Ether and Caffeine —Saline Hypodermic Injections—Treatment of Collapse at the Crisis—Ether and Morphine for Nervous Dyspnœa—Delirium—Sleeplessness—Cough—Gastric Catarrh—Diarrhœa —*Treatment of Convalescence and Delayed Resolution.*

CATARRHAL, LOBULAR, or BRONCHO-PNEUMONIA: Mode of Origin —Bacteriology—Course—Anatomical Lesions—Symptoms and Physical Signs—*Indications for Treatment*—Benzoate of Soda—Sprays—Saline Drinks—Emetics—Embrocations—*Treatment of Symptoms*—Cough—Pyrexia—Gastro-intestinal Symptoms —Nervous Symptoms—Respiratory Failure — Stimulants — Food—Convalescence.

SECONDARY PNEUMONIAS: Gangrene of Lung.

Additional Formulæ.

IN dealing with the important subject of the **treatment** of **pneumonias** our task will be facilitated by dividing them into three classes: (1) *acute lobar pneumonia*, the "*croupous*" pneumonia of German writers; (2) *catarrhal, lobular*, or *broncho-pneumonia;* and (3) *secondary pneumonia*—i.e. pneumonia supervening in the course of other diseases.

ACUTE LOBAR PNEUMONIA.

We shall first deal with acute lobar pneumonia, characterised by the following **symptoms, physical signs,** and **anatomical lesions:—**

The attack usually begins suddenly with a well-marked *rigor*. The temperature rises rapidly, and may reach 104° in a few hours from the initial rigor. The skin feels to the touch peculiarly hot and dry; after the chill a bright-red flush is noticed on one or both cheeks, especially over the malar region, the eyes are glistening, the expression anxious, the nostrils working, and there is often a patch of herpes on the lips. There are the usual symptoms of toxæmia—fever, loss of appetite, thirst, furred tongue, headache, aching of the limbs, general malaise, scanty high-coloured urine. The pulse is quickened, as are the respirations, and it has been noted that, in most cases, the pulse and respiration ratio is disturbed; but this is not so uniformly the case as some authors maintain. The respirations may be accelerated to 30, 40, up to 60 in the minute, while the pulse-rate may range between 100 and 130; but it is not uncommon to find a much higher pulse-rate during some part of the course of the disease.

Besides these general symptoms, there are others complained of, referable to the local lesion. These may not appear until twelve or twenty-four hours after the appearance of the general symptoms. Pain in the side is one of these, and is dependent on the existence of pleuritis over the portion of involved lung. It is sometimes extremely severe (in a few cases it is absent), and it is aggravated by the respiratory movements; the patient endeavours to check these, and so increases the shallowness and, therefore, the rapidity of the respirations. Cough is another symptom, which is restrained by the patient as much as possible on account of the pain in the side that attends it. The cough is accompanied by expectoration which is brought up with difficulty, as it is scanty, and extremely tenacious and viscid. It usually contains blood mixed with it, altered in colour, so as to give to the sputum a "rusty" hue, or it may be bright red or of paler tint. Cough and expectoration are sometimes absent in children.

When the disease runs the usual average course it is common for the fever to terminate by "crisis," generally between the fifth and eighth days, sometimes a day or two earlier or later. The temperature falls rapidly, and in from six to twenty-four hours may reach or descend below the normal; and often a rapid convalescence follows. In other cases the fall of temperature is more gradual and prolonged, and the case terminates by lysis.

Associated with these symptoms the following physical signs may generally be found on examination of the chest. Usually over the base of one lung (the right most frequently), sometimes over the upper lobe, some loss of resonance, increasing, as the disease advances, to complete dullness on percussion, is found; over this area of dullness fine crepitations can usually be heard, with the inspiration, at the onset of the attack. When the lung, however, becomes solid from exudation into the air-cells, these sounds disappear. Tubular, bronchial breathing, and bronchophony are then usually to be heard over the affected portion of lung; there is also, commonly, *increased vocal fremitus* in this situation. Sometimes these auscultatory signs are replaced by mere loss of vesicular murmur. Friction sounds are often present.

These physical signs and the pulmonary symptoms depend upon the presence, first, of acute hyperæmic engorgement of the lung, and, secondly, of exudation into the air-cells, this exudation consisting chiefly of fibrin mixed with red and white blood-corpuscles and epithelial cells.

Accompanying these signs in the lungs there will nearly always be found acute dilatation of the heart, most marked in the upward direction at the situation of the thin-walled conus arteriosus.

It is common to speak of three stages—first, a *stage* of *engorgement*, or vascular dilatation and distension; secondly, a stage of *red hepatisation*, when the air-cells are filled with a solid exudation; and thirdly, a stage of *grey hepatisation*, when the exudation

into the air-cells is undergoing degenerative changes—but this change in colour may be only a post-mortem appearance. As we are only concerned now with the clinical history and course of pneumonia, enough has been said to characterise the form which we are at present considering. As recovery proceeds the exudation into the air-cells melts down, and disappears, some of it being expectorated, but most of it being absorbed. The pulmonary tissue again becomes permeable to air, the physical signs disappear, and the normal condition of the lung seems to be completely restored.

The symptoms we have mentioned as attending the course of acute pneumonia assume, in some cases, an aggravated character, and are accompanied sometimes by others even more serious still. We shall have to consider these fully: the pain in the side may be intense and almost unbearable; the cough may be so frequent as to threaten to exhaust the patient; the pyrexia may be so great as to demand active interference for its reduction; the dyspnœa may be extreme, and life may be threatened either from the extent of the inflammatory exudation, or from collateral pulmonary engorgement, or from cardiac distension and enfeeblement. Sleeplessness and delirium are both serious and distressing symptoms which are often present, and require careful attention. The most serious condition of all is the tendency to cardiac failure, the danger of which in severe cases should never be lost sight of.

We have yet to pass in review the question of **etiology** before we can satisfactorily set forth rational indications for the treatment of this disease.

That this form of pneumonia is not merely a local disease, with symptomatic pyrexia, as was formerly believed, is now universally admitted, and primary acute lobar pneumonia is regarded as an acute specific general disease, a *specific infective fever*, caused by a specific poison, an infective microbe, the lung affection being simply the characteristic local lesion.

The idea that pneumonia is usually caused by **chill** has been shown to be inaccurate, for careful investigation makes it clear that but a small percentage of cases of acute lobar pneumonia can be traced to that agency solely. Still, chill from exposure to cold seems to be a contributing cause in many instances. This is not inconsistent, as we shall see, with the view that its exciting cause is a specific organism. With regard to climatic and atmospheric influences, all that can be positively asserted is that the prevalence of pneumonia is not determined by cold alone, but that the presence of great vicissitudes of temperature, and especially exposure to cold winds from the north-east, seem to be related causally with its periods of greatest prevalence. In Great Britain it is most prevalent in March, April, and May—a period when there is much exposure to easterly winds, rapid and great variations of temperature, and at times high degrees of atmospheric moisture.

It is notorious that the state of the general health is lowered during the prevalence of these atmospheric conditions, and the constitution is less capable of resisting the invasion of infective microbes. And, as we have pointed out elsewhere, "winds are carriers of dust as well as abstracters of heat; and while, on the one hand, they carry away heat from the surface of the body, on the other hand they gather up dust of all kinds, and blow all manner of micro-organisms into our air-passages." Any depressing agency may predispose to pneumonia, such as chronic alcoholism, exhaustion from physical fatigue, and depressing emotions; and it may be that exposure to a cold wind acts both as a predisposing cause, by depressing the normal resisting power by rapid abstraction of heat, and as an exciting cause, by means of the infective organisms it scatters through the air.

The fact that the mortality from pneumonia increases with a low temperature and high winds has been attributed to the circumstance that these

atmospheric conditions lead to concentration and increased virulence of the specific poison by inducing closed doors and windows, and a lack, therefore, of free ventilation.

Debilitating conditions, early childhood, and advanced age, in association with unfavourable atmospheric influences, are, therefore, predisposing causes. There also would appear to be an individual predisposition to this disease, some persons having been known to suffer from a number of attacks. A very eminent London surgeon, who lived to be well over fourscore years, told the author that he had himself had six attacks of pneumonia, and cases have been recorded of repeated attacks up to twenty-eight times.*

Fränkel's pneumococcus is regarded as the chief, but not the sole micro-organism causally associated with this disease. Other names for this micro organism in common use are *Diplococcus pneumoniæ* and *Micrococcus lanceolatus*. The cocci are elliptical or lance-shaped, and occur in pairs or chains of 4 to 6 elements. In sputum or in fresh exudates they have a distinct capsule. It is an interesting fact that the pneumococcus is often found in the buccal secretions of normal individuals—from 20 to 85 per cent., according to the observations of different investigators. As might be inferred from this circumstance, it has been found that the virulence of given strains of this organism varies greatly from time to time. It also appears to increase in virulence with each passage through the human subject. In many epidemics the presence of pneumococci in the dust of rooms occupied by pneumonic patients has been demonstrated. It has been suggested as probable that droplet infection during coughing and speaking does much to disseminate the contagion.

Pneumonia must therefore be classified with the infectious fevers, and regarded as transmissible from person to person. The virulence of its infectiousness

* Musser and Norris, in Osler and McCrae's "System of Medicine," vol. ii., p. 549. London, 1907.

is not very great. "Under the ordinary conditions of the sick-room, the pneumococcus becomes harmless in about an hour and a half. The danger of infection, except for those in direct contact with the patient, may be entirely avoided by ample illumination and ventilation of the sick-room." This organism (in dried sputum), if exposed to sunlight or diffused daylight, dies in an hour; if kept in the dark it survives about four hours. It is an important observation that the pneumococcus may be obtained from the blood before any physical signs are evident, which seems to show that the lung solidification may be but the secondary localisation of a primary blood infection.

Other micro-organisms, such as Friedländer's bacillus, the streptococcus pyogenes, the colon bacillus, the bacilli of influenza and typhoid, and others also have the power of exciting pneumonia. The causal relations of acute lobar pneumonia to an infective organism having been established, and as a consequence its transmissibility from person to person, it becomes necessary, before considering the question of remedial treatment, to refer briefly to **prophylactic mensures.**

As the pneumococci die rapidly under the action of light and desiccation, the danger from infected sputum is easily avoided by abundance of light and ventilation in the sick-room. Dry sweeping or dusting should be avoided. Articles which may become contaminated, and which cannot be cleansed by cloths wetted with disinfecting fluid, ought to be removed from the sick-room. Owing to the rapidity with which the pneumococci become harmless on exposure to light and air the risk of infection is mostly confined to those in direct contact with the patient. It is an uncomfortable fact that a small number of persons constantly harbour virulent strains of pneumococci in their mouths, and convalescents from pneumonia may carry virulent organisms in their respiratory passages for weeks or months. It has also been

thought probable that infection may be acquired from some cases of common cold. It is therefore important to disinfect the sputum of pneumonic patients and convalescents—there should always be a sputum cup containing a strong solution of caustic soda. When possible the patient should be isolated. Visitors should not be permitted, more especially if delicate and feeble. Nurses should avoid needless handling of patients or remaining close to them, and their hands should be carefully cleansed after handling patients. Both nurse and patient—if the latter is well enough—should use some antiseptic mouth-wash at regular intervals. Persons exposed to infection should be careful to avoid all depressing influences, as well as exposure to cold or to great variations of temperature. Apartments that have been occupied by pneumonic patients should be thoroughly disinfected.

Having referred thus briefly to the clinical characters and the etiology of acute lobar pneumonia, we may now proceed to the consideration of the **indications for treatment.**

1. The first indication springs out of etiological considerations, viz. *to endeavour, if possible, to antagonise the injurious influences of the specific infective organism on the blood and the tissues.*

2. The second indication is obvious, viz. *to relieve and to endeavour to subdue dangerous or distressing symptoms.*

3. The third indication is also obvious, viz. *to support the patient's strength, and to endeavour to remove or moderate all conditions tending to exhaustion.*

We believe these three indications will cover the whole ground of the rational treatment of pneumonia.

Although possessing a certain historical interest, it would be a waste of time to examine here the various routine methods of treatment of pneumonia formerly pursued, and now abandoned—such as repeated blood-letting, large and repeated doses of tartar emetic, calomel, and other so-called antiphlogistic measures.

Nor shall we occupy valuable space by extended references to statistics. The fallacies underlying this method are especially evident in their application to the treatment of such a disease as pneumonia, as it takes no account of an infinite variety of modifying conditions that affect results, apart from the particular point this method may be called in to investigate.

It will be convenient to call attention, in the first place, to the recent accumulation of evidence in favour of the **open-air treatment** of pneumonia. Professor Stephen Smith Burt,* of New York, has very ably advocated this method, and we cannot do better than quote what he says:—"First in importance is an unlimited supply of fresh air to everyone, with few exceptions, suffering from this affection. . . . Outdoor air is a vital element in the treatment of tuberculosis, and it is my belief that, with a little further delay regarding pneumonia, we may reach a like understanding. . . . During an illness like pneumonia there is no danger of catching cold from simply breathing cold, fresh air. Let us place a patient, then, with this affection in a large sunny room with wide-open windows, if not actually upon a roof or a veranda, and thus continually supply the extra need of air caused by the toxæmia and the consolidation. If the weather is cold so much the better, for cold air, especially when dry, excites respiration and thereby promotes oxidation. . . . In some instances there may be an open grate fire, or any customary form of heat, to temper the air when there is small power of reaction. The patient must be kept comfortable by extra bed and other clothing. Hot-water bottles, if necessary, can be placed in the bed, and screens may be utilised for shelter from direct draughts. Two layers of coarse wire netting, between which are thin sheets of absorbent cotton, in the open windows, will filter the dust-laden air of a large city without hindering the desired ventilation. . . . Pure, cold air, especially when free

* *Med. Record*, March 30, 1907.

from humidity, is soothing to a feverish and delirious patient, and conduces to healthful rest and sleep; it promotes the appetite and improves digestion; it increases the strength of the heart and the tone of the arteries; it lessens the intensity of the fever and the frequency of the breathing; it adds to the bactericidal properties of the fluids of the body and of the cellular elements, and it stimulates elimination." Many American physicians have obtained very favourable results from this method.

We need not here enter into detail as to the attempts that have been made to obtain a **specific serum** for the cure of pneumonia. Most authorities are agreed that they have not been successful. Musser and Norris* observe on this subject that "various serums have been tried, but their use, so far as curative effect is concerned, has been valueless. . . Reports of individual observers have in some cases been very interesting, but when a large number of cases is reviewed the results are unsatisfactory." *Pane's anti-pneumococci serum* is not antitoxic, but antibacterial, and what is needed by the time a case of pneumonia comes under treatment is an antitoxin. It is moreover only feebly antibacterial.

Notwithstanding the good results reported by some enthusiasts, much cannot be expected from **vaccine-therapy.** In a disease which is induced not only by different organisms, but also by different strains of the same organism, it is clear that the vaccine must be prepared from the patient's own organism. Such a lengthy procedure will necessarily, in the large majority of cases, be forestalled either by the spontaneous recovery or by the death of the patient. The routine use of *stock pneumococcic vaccines,* pending the preparation of an autogenous vaccine, is supported only by the evidence of the opsonic index and temperature charts, on which they undeniably produce remarkable effects: but we assert without hesitation that these phenomena are not correlated

* Osler and McCrae's "System of Medicine," 1907.

to any apparent improvement in the condition of the patient. A sufficient initial dose is considered to be some 20 millions, which may be repeated, if there is no response, in thirty-six or forty-eight hours. If there is any field for the use of these vaccines, it is in the occasional sequels of the acute attack, such as delayed resolution, for which, as yet, our therapeutic resources are inadequate.

Skoda and Dietl, in 1847, may be regarded as, to some extent, the founders of the modern treatment of pneumonia, for they showed that whereas, when cases of pneumonia were practically left to themselves, or treated on the so-called *expectant* method, the mortality was rather less than 8 per cent., when treated either by *blood-letting* or by *tartar emetic* the mortality was nearly 21 per cent.

Having regard to the relative success of the **expectant** method, and to the natural history of cases of pneumonia, it has been maintained that the attempt to draw any conclusions as to the efficacy of any particular medicinal interference in the treatment of this disease is so beset with possible fallacies as to be useless; for since pneumonia is so prone, when left to run its natural course, to terminate suddenly and rapidly in complete recovery, it is quite unjustifiable, however good the results that follow any line of medicinal treatment may be, to maintain that they are due to that treatment, and not merely the natural issue of a series of remarkably benignant examples of the malady. This, it seems to us, is to assert too much. Surely a practitioner of experience and judgment, of acute observation and quick perception, acquires the faculty of distinguishing a *prolonged series of consequences* from a *prolonged series of mere coincidences.*

If such a practitioner sees that he obtains, in a uniform manner, better results with a particular method of treatment than with other methods of treatment, he may surely trust the observation

of his own senses, and conclude that it has had something to do with the better results obtained. And it must be remembered that the careful and guarded impressions of such an observer, who will not forget that pneumonia is a self-limited disease with a natural tendency to recovery, are worth more than the evidence of blindly and mechanically compiled statistics, accumulated by a variety of persons with very variable faculties for accurate observation and just inference.

We have ourselves been led in this way to the conclusion that **quinine** frequently exercises a beneficial influence over the course of acute pneumonias of the class we are considering and in cases that have seemed very unpromising. And this belief has impressed itself on a considerable number of other observers. We do not, however, look upon this drug merely as a depressor of temperature, as some appear to do, but we regard this effect as incidental to some direct action on the infective morbid agent, or on its activities. We have been led to conclude, from facts observed, that quinine is in some degree antitoxic to the toxins of many infective micro-organisms, in what precise manner it is impossible at present to say. To call this effect "germicidal" is unjustifiable, because it may possibly act in some way quite unconnected with the death of the germs.

We have not given, nor do we approve of giving, quinine in the large doses advised by Jurgensen and others; but we have always given it in a special manner, which we believe greatly influences its favourable action. We give from 1 to 3 grains every two to four hours, according to the age of the patient and the apparent severity of the attack, and we give it dissolved in citric acid, and then added to an alkaline mixture, so that it is really taken in an alkaline effervescing saline draught.

We have had abundant reason for believing that quinine given in this form has greater activity than can be obtained from it in the solid form or dissolved

in mineral acids. We therefore regard the adoption of this form of using it as all-important.

The following is the formula we usually prescribe :—

℞ Quininæ sulphatis ... ... gr. j ad iij.
Acidi citrici ... ... gr. x ad xv.
Sacchari * lactis ... ... gr. x.
Misce, fiat pulvis.

* The sugar is necessary to prevent the acid and the quinine from caking together and sticking to the paper.

This powder is dissolved in a little water and added to the following draught :—

℞ Potassii bicarbonatis ... ... gr. xv ad xx.
Ammonii carbonatis ... ... gr. iij ad v.
Syrupi aurantii ... ... ʒj.
Aquæ ... ... ad ʒj.

Misce, fiat haustus. This dose is given every two, three, or four hours, according to the age of the patient and the severity of the case.

We append copies of charts which show the course of the pyrexia in three consecutive and typical cases thus treated (Fig. 15). They were cases of quite average severity. One (case 2) was an alcoholic case, and one (case 3) was a boy with pneumonic consolidation of the whole of the right lung.

Case 1.—Male, aged 40. *Pneumonia*, lower lobe right lung, with pleuritic friction; had chronic bronchial catarrh before the attack. Systolic murmur at cardiac apex. Highest respiration-rate, 55; highest pulse-rate, 160. Tongue brown, dry, and tremulous. *Stimulant*, 6 to 8 oz. of brandy in twenty-four hours. Convalescence uninterrupted.

Case 2.—Male, aged 32; alcoholic. *Pneumonia* of right lower lobe and pleuritic friction, complicated with delirium tremens (not violent). Highest respiration-rate, 30; highest pulse-rate, 126. Tongue very dry and brown. Convalescence rapid and uninterrupted.

Case 3.—A boy, aged 7. *Pneumonia* of whole of right lung; dullness absolute from base to apex, back and front. Pleuritic frictions at base. Œdematous crepitation at extreme base of *left* lung. Highest respiration-rate, 54 highest pulse-rate, 180. In addition to quinine in

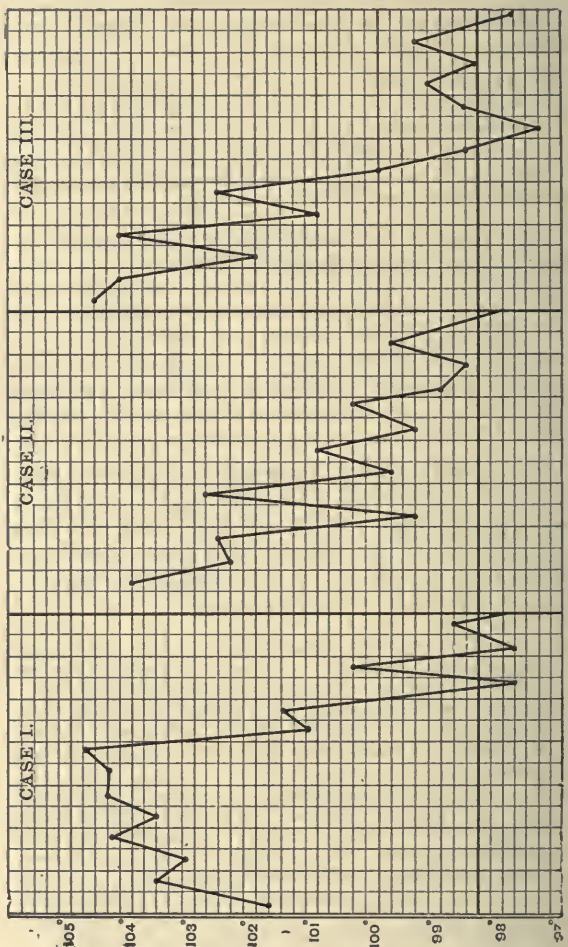

Fig. 15.—Chart of cases of acute lobar pneumonia.

effervescence, had 1-minim doses of tincture of aconite every three hours for three doses only. House physician's note: "Brought down temperature from 104° to 101°." Convalescence rapid and uninterrupted.

It will be seen that three doses of tincture of *aconite*—1 minim every three hours—were given to case No. 3, and the house physician added this note: "Brought down temperature from 104° to 101°."

We do not advocate the use of aconite generally in pneumonia; indeed, we are strongly opposed to its continued use as a routine remedy, or to more than a limited number of small doses. But given in small doses to children and young people *at the very onset* of an attack, and for twelve to twenty-four hours only, we are bound to bear testimony to its remarkably good effects. We have not seen any good results follow its use in adults, and we should consider its administration most unjustifiable in aged people. But it has some subtle influence, which we are quite unable to explain, over many of the febrile affections of children and young people. It allays the distressing sense of heat, it calms restlessness, and it promotes sleep. We give from 1 to 3 minims of the tincture every three or four hours for three to six doses, or one of Schieffelin's pilules of *aconitine*, each containing $\frac{1}{480}$ grain. We never give more than six doses, and restrict its use to the first twenty-four hours of the illness, and we must repeat that it is only in the young that we think it of value, and in the initial stage of the attack.

But to return to the question of the administration of *quinine* in pneumonia. Jurgensen, who was one of the first, if not the first, to place pneumonia amongst the infectious diseases, was also one of the strongest advocates of the use of quinine in this disease. He was a warm advocate of an antipyretic treatment of pneumonia, because he considered the pyrexia caused cardiac exhaustion, and that failure of heart power was the special and particular danger to be feared. But it is clear that if quinine

antagonises the activities of an infective organism upon which the pyrexia and all the disturbances connected with it depend—and there is as much reason for supposing that quinine acts in this way as in any other—then its value as an antitoxin must be far greater than that of a mere depressor of temperature—as, for instance, the cold bath—for not only, on this hypothesis, does it lower the temperature, but it acts also as a direct antagonist to the toxic agent in the body.

We give in a severe case 2 or 3 grains of quinine every three hours.

It will be seen that we have brought the use of quinine in pneumonia under the first indication, to endeavour, if possible, to *antagonise* the *injurious influences* of the *specific infective organism* on the blood and the tissues. We regard its action in pneumonia as analogous to its action in ague, and we do not give it, as we have already said, simply as an antipyretic. Finally, we may remark that all physicians are agreed that quinine must be given freely in those forms of pneumonia which arise in association with exposure to malarial influences.

Those who have written against the use of quinine in pneumonia cannot have taken the trouble to employ it in the way we have indicated; and as, in the business of daily life, it is easy to "damn with faint praise," so in therapeutics it is easy to "damn" with careless or unskilful application.

Various antiseptic agents have been suggested for the cure of pneumonia, with the idea of their exerting a bactericidal action; such as sodium benzoate, turpentine, iodine, ethylic iodide, the salicylates, and carbolic acid. We are not aware that any particularly good effects have been obtained from the use of these agents.

We may now pass on to the consideration of the second indication, viz.: *To relieve and to endeavour to subdue dangerous and distressing symptoms.*

The first of these we shall consider is **pyrexia** and **hyperpyrexia.**

Most physicians commence the treatment of an early stage of pneumonia by the administration of some simple febrifuge mixture, such as acetate of ammonia and sal-volatile, and at the same time order a laxative dose of calomel, to be followed by a saline draught in the morning.

Jurgensen maintained that the chief end to be aimed at by treatment in pneumonia is the reduction of temperature, as the chief danger is from cardiac asthenia, determined, in part, by the obstruction to the circulation presented by the pulmonary lesion: and that the continuance of the fever is especially dangerous to the force and integrity of the cardiac muscle. Others have doubted, and we are disposed to share the doubt, whether the high temperature has a greater influence in causing cardiac failure than the action of the specific poison on the nervous system; the state of the pulse may, therefore, be taken as a better guide to treatment than the temperature. Wilson Fox's experience* led him to the conclusion that a temperature up to 105° F. had very little apparent influence on the mortality in pneumonia, and that deaths at a temperature below are nearly as frequent as above 105°; the mortality depending chiefly on age, on complications, or on preceding or coexisting debility, from whatever cause, or on the amount of lung implicated, and especially on the implication of both lungs.

A careful and unbiased examination of the evidence of the effects of the **cold bath** in the treatment of pneumonia scarcely warrants its general employment or recommendation. For, although the statistics published by some Continental practitioners show fairly good results, it must be borne in mind that in some conditions, such as great debility, extent of lung involved, rapidity of respiration, advanced age, and the alcoholic habit, "which must increase the danger from pneumonia, this treatment has been considered inapplicable by those who have most largely employed

* "Diseases of the Lungs," p. 363.

it," so that it has really been tested chiefly in selected cases; and the very careful and cautious observer already quoted came to the conclusion that "cold bathing does not diminish the mortality of cases with temperatures above 104° F." He thought the method useful, however, in a few cases of pneumonia in childhood with danger of collapse of adjacent portions of lung. "The effect of the cold bath in advancing cyanosis is of a most markedly beneficial kind. It causes deep inspiration and the refilling of the lung, and may be, occasionally, the means of saving life."

The cold bath has been found to be dangerous in some cases, and its application has been attended by shock, collapse, and return of rigors.

We are not ourselves partisans of the general or indiscriminate use of the cold bath treatment of pneumonia: its routine application to all cases where the temperature is not more than 102° or 103° F., as has been advocated, we consider wholly unnecessary and unjustifiable. The arguments that have been used in favour of expectancy, and in opposition to drug or other active treatment, will certainly apply with quite equal force to the routine use of the cold bath.

We should greatly prefer, if we were inclined to such routine treatment, to substitute the *ice-cradle* for the cold bath. *Cold sponging* is a method that is far more generally serviceable than either of these methods, and in our experience quite as effective. Some advocate the use of a water-bed through which a stream of cold water is kept constantly flowing.

The local application of cold, however, has had a number of advocates. The practice of applying cold to the surface of the chest over the affected lung originated, no doubt, in the idea that it would influence favourably the local pulmonary lesion, and also relieve the pleuritic pain. But it seems far more probable that it acts as an antipyretic, and influences favourably the course of the pyrexia. Some apply cold compresses to the affected side, which are frequently renewed.

The application of an *ice-bag* is a great improvement on this method, as it does not need frequent renewal, as the cold compresses do.

There appears to be some risk of chill and collapse if this treatment is applied to feeble children, and the temperature in all cases should be frequently taken during its application. The ice-bag should be removed if it falls below 100°, and may be reapplied if the temperature rises again to above 102°. The ice-bag should not be applied over the præcordial region, as it is liable to exercise a depressing influence on the heart. If symptoms of cardiac depression appear, brandy must be given and heat applied to the extremities.

An *ice-poultice* is made with a double thickness of gutta-percha tissue. The lower leaf is sprinkled with a thin layer of linseed-meal, and then covered with small pieces of crushed ice to the depth of half an inch. The ice is sprinkled with common salt, and then with another layer of linseed-meal. The upper leaf is turned over the lower, and the edges are sealed with chloroform or turpentine. The poultice is placed in a flannel bag, and applied with a fold of lint under it (Stewart and Cuff).

The local application of ice to the chest or to the spine certainly has a powerful influence over the temperature in this disease, and appears to subdue the pyrexia quite as surely as cold baths, while it is much more convenient to apply and far less exhausting to the patient.

Many **drugs** have been advocated as antipyretics in acute pneumonia.

We are not greatly in favour of the use of modern antipyretic drugs in the treatment of this disease, on account of the cardiac depression they not infrequently produce. In the pneumonia of children *antipyrin* has been said to allay restlessness, quiet delirium and cough, and promote sleep, as well as reduce temperature; it has been given in 2- to 6-grain doses every six or eight hours, according to the age of the child.

We prefer *phenacetin* to antipyrin as a depressor of temperature. It has not the same tendency to cause cardiac debility. We have given it with excellent results in quite small doses in severe cases of influenzal pneumonia. In one, a very severe form of influenza, the temperature reached 106° F. There was extensive pneumonic consolidation of one lung, the lower two-thirds, and congestive hyperæmia with dullness and œdematous crepitation at the base of the other lung. There was active delirium. The tongue was dry and furred, the respirations 60. The patient —a young woman—was given 1 grain of phenacetin with 1 grain of hydrobromide of quinine every hour for nearly three days, during which the temperature fell, the delirium disappeared, and the lung began to clear; and she made a rapid and uninterrupted recovery. She was watched very carefully for any signs of cardiac depression while she was taking the phenacetin, but no sign of any such effect was observed.

Sodium salicylate has been advocated by some as of value in the pyrexial stage of pneumonia. *Aspirin* is, in our opinion, of greater value, and incidentally is analgesic as well.

Pain, which is due to accompanying pleuritis, is a symptom we should do our best to relieve, for not only does it tend to exhaust the patient by preventing sleep and causing restlessness, but it aggravates the dyspnœa by inducing the patient to make very shallow inspirations for fear of increasing the pain. The application to the painful side of three to six leeches, followed by a hot compress sprinkled with laudanum, is one of the best remedies. We prefer a light compress to the heavy mustard and linseed poultice, which is apt to embarrass breathing. At night, 5 to 10 grains of Dover's powder in a draught with 3 drams of solution of acetate of ammonia and 1 ounce of camphor water is also useful. This is safer than a hypodermic injection of morphine, for in some cases morphine will cause great cardiac depression,

and it must, therefore, on no account be given to feeble and aged patients. A combination of a small dose of morphine with one of strychnine, or with a small dose of nitro-glycerine, has been suggested as safer than morphine alone. Speaking generally of the use of opium in pneumonia, we are in agreement with the late Sir W. T. Gairdner, who has said, "I regard opium as a drug of extreme danger in pneumonia. I am aware that men of great eminence have taught otherwise. But in so representing the case I am not advocating any theory, but rather am dealing with facts which I know to be true and which, if true, are such as ought to be in the mind of every practitioner. I have repeatedly seen what can only be regarded as poisonous effects from very moderate doses of opium in certain stages of pneumonia; and (especially towards the crisis) have learned to dread it more than almost any other drug." * No doubt, if given at all, for the relief of pain or cough, it must be given with great caution, discrimination and special consideration of the particular circumstances of the case. Ice-bags and ice-poultices, together with the application of strapping to the chest, have been found effectual also in relieving pain.

Dyspnœa, when it occurs in an aggravated form, with extremely rapid, shallow respirations, and accompanied by cyanosis, is one of the most serious symptoms we have to combat in pneumonia. It is nearly always an evidence of commencing **cardiac failure.** Owing to the obstruction this also offers to the circulation through the lung, the right side of the heart becomes distended, and the pulse small, weak, and rapid. In more advanced stages of the disease, collateral congestion and œdema of the lung may have more to do with the causation of the dyspnœa than the extent of pneumonic infiltration. There is also a nervous form of dyspnœa, due probably to an intense action of the blood-poison on the nervous

* "The Extreme Danger of Opium in Pneumonia," *Glasgow Med. Journ.*, April, 1902.

system, and characterised by extremely rapid respirations, and by the absence of the marked cyanosis which accompanies the preceding form.

In the first of these forms of dyspnœa **bloodletting** is indicated, in order to afford immediate relief to the over-distended right heart. From 4 to 10 ounces of blood should be withdrawn from a vein in the arm; in feeble persons not more than 4 ounces, in the robust 8 or 10 ounces. This measure usually affords temporary relief, and so time is gained for the application of other remedies; and this, indeed, is the chief value of venesection, for its remedial effect is often brief, and if it be repeated frequently it will compromise the patient's chances of recovery by directly contributing to cardiac asthenia. Stimulants, therefore, must at the same time be given, and ammonium carbonate, ether, and strychnine to maintain the cardiac action.

We have said nothing as to the propriety of bleeding in the early stage of this disease, which was at one time so common. It is but rarely that we see a case in which it is indicated, but we agree with Osler, who says it is "good practice at the very outset in robust, healthy individuals in whom the disease sets in with great intensity and high fever." In such cases it relieves pain and dyspnœa, reduces temperature, and allays cerebral excitement.

The *hypodermic injection of strychnine* is a valuable resource in these cases of grave dyspnœa with struggling cardiac action; from $\frac{1}{64}$ to $\frac{1}{32}$ grain may be given at intervals of an hour for three or four doses. *Pituitrin* has certainly proved of value in the treatment of rapid heart failure. It is supplied in glass ampoules, which may be kept at hand ready for use in emergency. The ampoule is broken, and the fluid allowed to escape under the tongue. *Inhalation of oxygen* has been largely used in order to maintain life under such conditions, but it should be *continuous*, for even after it has caused a complete rally, and the danger seems to have been overcome, the dyspnœa

and cyanosis are apt quickly to return on the discontinuance of the inhalation of the gas. Its use has been continued for four days and nights by one practitioner, and for 106 hours by another; in the latter instance an average of 200 gallons of the gas was consumed in twenty-four hours. The gas should be warmed, and bubbled through alcohol.

The inhalation of oxygen might often be employed earlier in the course of the disease than it now is, with advantage; its application should be begun whenever feebleness and irregularity of pulse and blueness of the lips indicate increasing feebleness and distension of the right ventricle.

Recently our own practice has been to instruct the nurse to administer the oxygen regularly every hour or two for five or ten minutes at a time, and not to await the onset of asphyxial symptoms, so as to forestall intoxication of the respiratory centre.

Patients will often resent the taste of oxygen conveyed through a length of rubber and sometimes through a rubber gas-bag as well; the objection may be met by the use of flexible metal gas-tubing in place of the length of rubber tube. This may be attached by a short rubber connection—not more than three or four inches long—to the cylinder, and by a similar contrivance to a glass mouth-piece, which is inserted between the patient's lips, and which can be readily cleansed each time it is used.

An incidental advantage of employing metal gas-tubing is, that we can heat the cold gas, before it reaches the patient, by laying the coils in a basin of hot water.

Dry-cupping has been found useful by some physicians, who prefer it to bleeding. "Cupping should not be limited to the supposed site of the inflammation, but the cups should be applied all over the lungs, front and back, to the number of twenty or thirty. It should be done early, and repeated every six or eight hours as long as pain persists, the dyspnœa or oppression continues, or the respiration-rate rises. After

cupping, the pain may further be relieved by thorough strapping of the chest. The fixation induced is of immense relief." *

We now reach the third indication : *To support the patient's strength, and to endeavour to remove or moderate all conditions tending to exhaustion.*

It is generally admitted that the great danger to life in pneumonia is the tendency to **cardiac failure,** and it is to prevent this, in the last stage of the disease, that all our efforts must be directed.

It is hardly necessary to point out that the patient should be kept absolutely at rest in a comfortable bed in an airy, well-ventilated room, and as quiet as possible. He should not be disturbed unnecessarily, or moved about and exhausted by too frequent physical examination. His diet should be fluid and light, and adapted to the enfeebled digestive powers, and to the febrile state. Milk, diluted with water, or some effervescing alkaline water when there is any tendency to sickness, is a good and convenient food. The occasional vomiting of coagulated milk should be carefully noted, for it then usually requires further dilution with some alkaline water, or it should be peptonised. Light clear soups and broths may also be given; there is no harm in a cup of well-made tea or coffee now and then, and they are both cardiac stimulants. Strong coffee is too little used in these cases. It has a tonic effect on the heart. Thirst may be allayed, and the mouth kept clean and moist, by sipping iced lemonade, the juice of an orange, toast water, or barley water, according to choice.

When more stimulating food seems called for, eggs may be given beaten up with boiling water, which partially cooks them, and one or two dessertspoonfuls of brandy or whisky added. Strong beef-tea or meat-juice and arrowroot may also be given with some added spirit in the same way. If there is coexistent bronchial catarrh, and the expectoration is viscid

* Musser and Norris, in Osler and McCrae's "System of Medicine" (1907), vol. ii., p. 638.

and difficult of expulsion, hot milk and seltzer water in equal parts, with two or three teaspoonfuls of brandy, serve both as a stimulating food and a useful expectorant.

We entirely agree with the recommendation of frequent large draughts of cold water (4 to 8 ounces) every hour or two as an excellent eliminant (diuretic)* and remedy for the toxæmia. It may be made pleasant by the addition of a little syrup of lemon and a few grains of salt, the latter with the view of meeting the possible need of chloride of sodium in the tissues, seeing that it is absent from the urine, or greatly diminished, in this disease.

With regard to the use of **alcoholic stimulants,** we are convinced that in more than two-thirds of the cases of acute pneumonia, as they are generally encountered, there is no need for them whatever. The routine administration of alcohol in pneumonia, especially in the early stages, with the idea of preventing cardiac failure later on, is, we think, a serious error. Alcohol produces vaso-motor *paresis*, and causes dilatation of the vessels, and it must, therefore, aggravate or induce tendencies to vascular engorgement. It acts like a poison on many persons, and causes considerable nervous and general depression after its first stimulating effect passes off; it increases the amount of toxic substances in the blood, and the elimination of considerable quantities of alcohol must impose a severe strain on the already overtaxed organs of excretion. When we further consider the large quantity of impure spirit—brandy and whisky—which must be used in hospital practice (for the pure and best kinds are very costly), we are disposed to believe that some of the more serious forms of cardiac failure, with albuminuria and gastric and hepatic congestion, encountered in the later stage of pneumonia, are, to a certain extent, contributed to by the excessive and premature use of impure alcohol.

* Musser and Norris, in Osler and McCrae's "System of Medicine," vol. ii., 1907.

The early routine use of alcohol takes from us also the power of resorting to it as a fresh resource in advanced stages, when in exceptional cases it may be of undoubted use.

The very same objection that has been made to inferring from results as to the value of any particular remedy in a disease like pneumonia, with so strong a tendency to terminate in a rapid crisis and complete recovery, must apply with equal force to the inferences that have been drawn from the routine use of alcohol. In well-marked adynamic cases, however, the use of alcohol is indicated, and we should make some efforts to obtain it pure. In the pneumonia of drunkards, and of the aged, it is especially needed. We should begin with moderate amounts—4 to 6 ounces of whisky or brandy in twenty-four hours—and increase them if necessary. Dr. Wilson Fox thus formulated the indications for its use: "Rapidity, irregularity, intermittence, and dicrotism of pulse, great rapidity of respiration, cyanosis, with a rapid, feeble pulse, irregularity of breathing, and signs of pulmonary œdema, tremor, subsultus, muttering delirium, or delirium in patients addicted to alcoholism, and profuse sweating during the febrile period, are all indications for alcohol. When these symptoms are severe alcohol must occasionally be used unflinchingly and unsparingly." *

A moderate amount of alcoholic stimulant in the form of good, sound wine, such as port or burgundy, or champagne if it is preferred, or 2 or 3 ounces of whisky or brandy in the day, is often needed after the crisis, and during convalescence. It will then be of much help in restoring the strength of the patient.

Cardiac failure may arise in two ways: either, owing to the extent of the pneumonic consolidation of the lung, and the obstruction to the circulation in the pulmonary vessels and the venous system generally, so produced, the right side of the heart becomes over-distended, and there is a tendency

* "Diseases of the Lungs," p. 372.

to clotting in the right heart and arrest in diastole; or, owing to the intensity of the septic infection and the pyrexia, there is a general loss of cardiac power, with well-marked nervous disturbance, and great general prostration. We have already alluded to the possible usefulness of *venesection* when the first form of cardiac failure is seen to be impending: the great objection to its employment, except in vigorous persons, and in small amount, is that if it fails to help the struggling heart over the critical period it may leave the patient in a worse condition to fight through the final stages of the disease than before. With this exception, the treatment of both forms of cardiac failure is the same.

Many physicians prescribe **digitalis** with a view to forestalling cardiac failure, but we consider it a useless drug in the presence of high fever. Far more reliance is to be placed on **strychnine.**

Hypodermic injections of ether to stimulate the heart in these grave cases of adynamic pneumonia, 20 to 30 minims, quickly repeated if necessary, have been found a valuable resource in many instances. Huchard combines injections of **caffeine** with injections of ether. He believes the former to be purely tonic to the heart, and the latter only stimulating. He dissolves the caffeine in distilled water with the aid of sodium salicylate—a dram of caffeine and 45 grains of sodium salicylate are dissolved in $1\frac{1}{2}$ drams of warm distilled water; $\frac{1}{10}$ of this, containing 6 grains of caffeine, is injected at a time, and may be repeated six or eight times in twenty-four hours. Many authorities agree in commending the use hypodermically, or by rectal injection, of **normal saline solution** in certain cases of marked toxæmia. This has been found of great utility when administration has not been too long delayed. Prof. S. S. Burt says: "The introduction of this solution under the skin, a procedure known as *hypodermoclysis*, has rescued a number of patients in my practice, as well as in that of many others, from impending dissolution. Care should be observed not to inject more than one dram of

this solution to every pound of the body weight in each quarter of an hour, lest the tissues become injured by inundation." One to two pints may be allowed to flow under the skin from a rubber bag, the injection being repeated, if necessary, at intervals of eight to twelve hours.

In every case of pneumonia it is wise to instruct the nurse to be on the look-out for collapse attending the crisis of the disease. Hot bottles should be placed in the bed without delay; half an ounce or an ounce of brandy should be given in hot water; and she may be instructed beforehand to give 5 minims of liq. strychninæ subcutaneously, if it seems to be called for. Inhalation of alcoholised oxygen is another valuable means of counteracting this critical collapse.

The nervous form of dyspnœa may be relieved by morphine and ether; $\frac{1}{6}$ grain of acetate of morphine and $\frac{1}{2}$ dram of spirits of ether may be given in peppermint water, and repeated if needful after some hours. We must be quite sure that the dyspnœa is nervous, as it would be a serious error to give morphine if the dyspnœa were due to respiratory obstruction.

Delirium, when it occurs early, as it is apt to do in the course of pneumonia, is usually dependent on the intensity of the toxæmia, and on the severity of the action of the poison on the nervous system. At this period it is best dealt with by such means as reduce the pyrexia, and these we have already detailed; an ice-cap to the head, cold sponging, or the local or general application of cold. But when the delirium depends on a special excitability of the nervous system, or on exhaustion at a late stage of the disease, some special means must be adopted for its relief. *Musk* was a favourite remedy with Trousseau for this symptom, given in 5-grain doses. A more trustworthy remedy is a combination of chloral and bromide of potassium; 20 grains of the former and 30 grains of the latter drug should be given at once, dissolved in an ounce of camphor water, and repeated when necessary. Douglas Powell has recom-

mended, for violent delirium at this period, frequently repeated doses of alcohol, given with some fluid food, and followed by a hypodermic injection of morphine and atropine. The subcutaneous injection of hyoscine, $\frac{1}{100}$ grain, is sometimes necessary.

Sleeplessness may precede and accompany the delirium, and requires similar management; but when it is dependent on *pain*, *cough*, *dyspnœa*, or *exhaustion*, it can, obviously, only be relieved by remedies which relieve these other symptoms and states. The surroundings of the patient should, of course, be such as tend to promote sleep: a quiet, cool, well-ventilated room, a comfortable bed, etc.

Cough is a symptom which, when frequent and distressing, requires treatment. So long as the cough is attended by expectoration of the peculiar pneumonic sputum, or of frothy mucus from coexisting bronchial catarrh, it would obviously be mischievous to give sedatives to arrest it. Such a cough is essential and useful for clearing the air-passages of obstructive secretion. But it sometimes happens that there is much and distressing irritative cough, unattended by expectoration; this may be due to the extreme viscidity and tenacity of the sputa, and the consequent difficulty in detaching them and expelling them from the air-passages, or it may depend on some laryngeal irritation which may be the seat of a coincident dry catarrh. A cough of this kind, if left unrelieved, will add greatly to the patient's distress and exhaustion, as it will prevent sleep, and the mere muscular efforts of ineffectual coughing are most exhausting. If the cough is due to the difficulty of expelling dry viscid sputum, then warm alkaline sprays (Ems or Bourboule water is suitable) will be found most useful. The following is a very good formula:—

℞ Sodii bicarbonatis ... ... gr. x.
Sodii chloridi ... ... gr. v.
Glycerini acidi carbolici ... ... ℥ss.
Aquæ laurocerasi ... ... ℥ii.
Aquæ ... ... ad ℥j.

Misce. To be used as a spray.

This should be applied warm by means of a Seigle's steam spray-producer. At the same time the patient should be given an occasional drink of alkaline water (Ems, Vichy), mixed with a little hot milk and a teaspoonful or two of brandy or whisky, or a mixture containing ammonium carbonate and spirits of chloroform may promote expectoration. If this fails to relieve, and the cough seems due to laryngeal irritation, from 2 to 5 grains of Dover's powder mixed with a little chloroform water may be given occasionally; small doses of tartar emetic are often extremely useful in allaying this symptom. A teaspoonful occasionally of the following linctus will rarely fail to relieve such a cough:—

℞ Vini antimonialis ... ... ʒij.
Ammonii carbonatis ... ... gr. xviij.
Liquoris morphinæ hydrochloridi ... ʒj.
Aquæ laurocerasi ... ... ʒiv.
Syrupi simplicis ... ... ad ʒjss.
Misce, fiat linctus. One teaspoonful for a dose.

Gastric catarrh of an acute form and **diarrhœa** are apt occasionally to occur in some cases of acute pneumonia, which for this reason have been termed cases of *bilious pneumonia.* These symptoms are not infrequently induced by injudicious feeding; by an over-anxiety to give food when the stomach is not in a state to digest it, when the tongue is thickly coated, and the mouth foul and covered with a dryish, sticky secretion. On percussion of the stomach it will often be found to be dilated from indiscreet over-feeding with food that cannot be absorbed. Vomiting will occur in such circumstances, and sometimes diarrhœa. To prevent these symptoms it is a good plan, if we see the case early, to give, at the very onset, a grain or two of calomel followed by a saline aperient, so as to sweep away any foul, irritating substances that may be retained in the alimentary canal; or the same remedy may be applied when the symptoms of gastric catarrh present themselves. The food should

be restricted to milk diluted with an equal quantity of water, and containing 10 or 15 grains of bicarbonate of soda to each cupful. A little water arrowroot with a small quantity of brandy may also be occasionally given. A mustard plaster to the epigastrium will relieve the tendency to vomiting. It will rarely be necessary to have recourse to any other means than these to relieve the gastric catarrh and arrest the diarrhœa. If the latter symptom, however, should be troublesome, it can usually be controlled by a few doses of Dover's powder (2 to 5 grains) with bismuth subnitrate (5 to 10 grains).

Some consider, as we have already pointed out, that means for **disinfection** should be applied in cases of pneumonia, more especially in its epidemic forms ; the linen should be treated as in other infectious diseases, and the sputa should be destroyed, and as the germs may linger in the mouth in a state of activity, this cavity should be disinfected by means of antiseptic mouth-washes ; this would lessen the danger of re-infection as well as the risk of infecting others. A tablespoonful of *Listerine* in a wineglassful of warm water would answer the purpose. "The eyes, nose, throat and mouth should be kept thoroughly cleansed with mild antiseptic lotions" (Musser and Norris).

The discharges should be disinfected and destroyed at once.

We have already dwelt on the necessity of keeping the sick-room freely supplied with fresh air and as much sunlight as possible. Its temperature should never exceed 65° F., and none but the necessary attendants should be admitted.

The patient should have light woollen underclothing, never heavy enough to cause discomfort or perspiration. The "jacket poultice," once so popular, is now generally discarded.

Convalescence from acute pneumonia is often rapid and uninterrupted ; at other times, especially if the acute period has been prolonged, and the *crisis* late, or if the pyrexia has terminated gradually and

not by crisis, the convalescence may be protracted and requires care and watching. A light, sustaining diet, with a moderate amount of wine or other stimulant, will be needed, as well as quinine, strychnine, and iron as tonics, and a slow disappearance of the lung infiltration may require the application of a few flying blisters or iodine paint over the area of dullness. We have found such counter-irritation promote the disappearance of the exudation: indeed, we regard this as the special use of counter-irritation, and in ordinary cases we reserve its application for this stage of the disease. In strumous cases we have seen iodide of iron in combination with cod-liver oil of much use in quickening the disappearance of the exudation, and the complete clearing up of the lung. Two American writers (Edsall and Pemberton) * have advocated the application of the X-rays to these cases of delayed resolution. This measure, they state, is attended by a rapid clearing up of the consolidated areas, accompanied by a very marked increase in the metabolic output through the urine.

It will often, however, be necessary to have recourse to change of air, to removal to the seaside or to some bracing mountain resort, to completely restore the affected lung to a healthy condition.

Catarrhal, Lobular, or Broncho-Pneumonia

Cases of this form of pneumonia differ in many respects from the preceding—in their mode of origin, in their course and termination, in their anatomical lesions, and in their symptoms and physical signs.

The **indications for treatment** will also differ somewhat.

These cases usually originate in a pre-existing bronchitis, the inflammation of the bronchioles extending to the contiguous air-cells, and they are, therefore, **caused** by the same conditions as induce bronchitis; and these we have already considered. They are, however, very prone to occur in those forms

* *Amer. Journ. Med. Sciences*, Feb., 1907.

of bronchitis which accompany the infective fevers, such as measles, whooping-cough, influenza, diphtheria, etc., and especially when these diseases attack children, or others who are living in unfavourable hygienic conditions. In the case of the acute infectious fevers, the infection of the lung is by no means always homologous.

Various organisms have been found in the lungs in broncho-pneumonia. The pneumococcus of Fränkel has been found in 50 per cent. of the cases. Other organisms found include Friedländer's pneumo-bacillus, the streptococcus pyogenes, the staphylococcus pyogenes aureus and albus, bacillus influenzæ, and bacillus coli. Some of these organisms are commonly present in the oro-nasal cavities, and under certain circumstances and conditions of the air-passages they may be drawn by inhalation into the air-cells.

Attacks of broncho-pneumonia are very common in early childhood, but they are not so generally restricted to that period as has been thought. In epidemics of influenza they occur at all ages, and they are common in old age and in debilitated states. The existence of heart disease and pulmonary emphysema favours their occurrence. Constitutional syphilis, scrofula, and rachitis in children predispose to these attacks.

Some cases of broncho-pneumonia, particularly those associated with the pneumococcus, set in with all the abruptness of lobar pneumonia. There may be an initial convulsion, if the subject is a child, with rapid rise of temperature to 103° F. or more, and after five or six days of acute fever the temperature may fall by crisis. More often, however, the invasion is gradual, being preceded by the ordinary signs of bronchitis. Cases then run no definite cyclical or typical course, as do cases of lobar pneumonia; their course is variable and irregular, sometimes terminating fatally in a few days, sometimes lasting many weeks, and ending with a slow and gradual convalescence. The mortality is much greater than that of lobar pneumonia.

The two forms differ in the characteristic anatomical lesions, and their distribution. In this the inflammation, creeping on from the bronchioles, affects scattered groups of lobules, hence the name *lobular;* these, however, may coalesce, and so closely simulate *lobar* pneumonia. This becomes associated, to a greater or less extent, with collapse of other lobules, an important lesion the mode of occurrence of which we need not now stay to explain. But these collapsed air-cells are apt themselves to become the seat of pneumonia. The exudation into the air-cells differs also from that of croupous pneumonia in being composed chiefly of epithelial cells, and the cells of catarrhal bronchitic exudation drawn into them during inspiration, together with leucocytes, a few red blood-corpuscles, and only a scanty proportion of fibrin. The bronchial tubes are prone to undergo dilatation, especially small globular dilatation of the fine tubes. These scattered lesions usually affect both lungs, so that the disease is commonly bilateral. The bronchial glands, as a rule, become inflamed and swollen.

The attacks differ in their symptoms and physical signs; these are, of course, to some extent those of the accompanying and antecedent bronchitis, and they vary greatly in their severity, according to the extent and intensity of the local inflammation or the attendant constitutional state. The cough is usually an important and troublesome symptom, and is apt to occur in severe suffocative paroxysms. The dyspnœa may be very great, and the respirations very rapid, rising even to 100 in the minute, according to the amount of obstruction to the access of air to the air-cells. The expiration is usually prolonged and laboured. The sputa are bronchitic or puriform, not rusty; they are very tenacious, and young children rarely expectorate them.

The fever is somewhat irregular; at first the temperature may be that of acute bronchitis, or of the infective disease of which it is a complication, and may not exceed 102° to 103° F. Subsequently it may

rise to 104° or 105°, and there are often considerable daily fluctuations. The defervescence, as a rule, is gradual, and not by crisis. When the temperature is high, and the respirations are rapid, the pulse is also very quick, and usually small and feeble, and may reach 160 to 200; the face is cyanosed. In severe cases there is also marked tendency to gastro-intestinal catarrh, with great thirst, a brown and dry tongue, and diarrhœa, and there is likewise a great tendency to cerebral disturbance, restlessness, delirium, convulsions, stupor, and coma.

In cases that recover the convalescence is not so rapid as in lobar pneumonia, nor is it often so complete. Recovery is gradual, and there is a certain tendency to the sequence of chronic pulmonary disease, or the development of rachitis, or the occurrence of gastro-intestinal irritation.

The physical signs differ from those of croupous pneumonia, excepting those cases in which large areas of lung are affected simultaneously. There are, of course, those of the coexisting bronchitis—viz. sonorous and sibilant, dry and moist râles heard over the greater part of the chest; and there may also be the signs due to catarrhal obstruction of the air-passages, and attendant collapse and emphysema, viz. immobility of the chest and sinking-in of the lower ribs.

But the physical signs dependent on the onset of this form of pneumonia are somewhat obscure, unless considerable areas of lung near the surface are involved. If the pneumonic spots are small in extent and surrounded by healthy lung, they will yield no characteristic signs to percussion or auscultation. The portions of lung, however, most liable to pulmonary collapse extend from the base upwards, in a somewhat conical form, along each side of the spine, and here gentle percussion may show the presence of dullness on both sides. Fine subcrepitant râles may also be heard over the dull areas, with blowing expiration. The physical signs, however, of pulmonary

consolidation are usually much less evident than in cases of croupous pneumonia, but careful and skilful percussion and auscultation will usually detect in some part of the chest the signs of spots of pneumonic infiltration.

From this brief sketch of the character and course of broncho-pneumonia we may be assisted in formulating **indications for treatment.**

The first of these is *to promote the removal of obstructions in the air-passages*, and so *favour lung expansion* and *prevent the extension of lung collapse.*

The second is *to relieve distressing and exhausting symptoms*, such as *cough, dyspnœa, fever, diarrhœa, cerebral irritation, etc.*

The third is *to support the strength of the patient*, and ward off debility and exhaustion by every possible means.

Obviously the remedies which will respond to the first indication will, to some extent, aid in the second, and those which answer to the first and second will further the third.

For the purpose of promoting the expulsion of the mucus from the air-passages, and lessening its viscidity, we use *benzoate of soda* internally, and the frequent application of warm *alkaline sprays* containing some *glycerine of carbolic acid.* In those cases occurring in connection with infective diseases the benefit attending this method of treatment will often be found remarkable, while it is a therapeutic method absolutely free from any possible objection.

From 5 to 20 grains of benzoate of soda, according to the age of the patient, with 1 to 4 drams of chloroform water, should be given every two or three hours, and a warm spray of 1 dram of glycerine of carbolic acid or 1 dram of compound tincture of benzoin, to each pint of water, should be freely sprayed in front of the child, so as to be inhaled with the respired air. This can easily be arranged by mounting a good-sized Seigle's steam

spray-producer at a suitable level, and allowing the steam spray to flow under the hood of the child's cot: this may be carried out for an hour at a time several times in twenty-four hours. (*See* Fig. 21, vol. ii., p. 601.) It is desirable in these cases that a flannel tent should surround the child's cot or bed, so as to shut in this warm, moist atmosphere, rendered additionally so if necessary by a steam kettle. The increased fluidity which such an atmosphere gives to the bronchitic secretion is of the greatest importance in promoting its expulsion. Warm saline drinks serve the same purpose, and the patient should be made to drink frequently a small quantity of hot milk mixed with about twice as much seltzer or Apollinaris water, to which a little whisky or brandy should be added, from 10 drops to 1 or 2 teaspoonfuls, according to the age and condition of the patient. These measures afford relief also to the cough, the distressing paroxysms of which are caused by the violent expiratory efforts to expel the tenacious mucus adhering to the air-tubes and obstructing respiration. As these violent expiratory efforts tend to cause pulmonary collapse, it is important they should be moderated and controlled, and if the measures just described do not sufficiently control the cough, some sedative must be cautiously administered for the purpose. The greatest caution must, however, be exercised in the use of opiates, lest they should by any means interfere with expectoration, and so add still further to the respiratory obstruction. This may best be obviated by giving very small doses, and combining them with expectorants and stimulants. One great advantage, which can scarcely be overestimated, attending the occasional administration of minute doses of opium, is the relief it usually affords to the restlessness and nervous disturbance. Dover's powder in doses varying from $\frac{1}{4}$ to $1\frac{1}{2}$ grains may be given to children from 3 months to 5 years of age, with $\frac{1}{2}$ grain to 2 grains of ammonium carbonate, and a little syrup and water, once or twice in the twenty-

four hours. Small doses of bromide of sodium—2 to 5 grains at a time, according to the age of the child —sometimes exert a valuable sedative and hypnotic influence.

In older people, and in more chronic cases, the ordinary expectorant remedies may be prescribed, but we have found them of little use in young children who do not know how to expectorate. Any expectoration that accumulates in the child's mouth and fauces must be carefully removed by the nurse. A useful form for adults is carbonate of ammonia, 5 grains; chloride of ammonium, 10 grains; ipecacuanha wine, 5 minims; and infusion of senega, 1 ounce. This dose may be given three or four times a day.

Emetics have been recommended for this purpose, and especially ipecacuanha, to promote the expulsion of the mucus that accumulates and obstructs the air-passages, and an occasional emetic of 10 to 20 grains of ipecacuanha powder, mixed with a little warm water and syrup, may with advantage be administered. The effect of the emetic is to relieve dyspnœa, to lessen cyanosis, and to prevent the tendency to collapse.

The drawback to the use of emetics is that they cannot be frequently repeated without producing much exhaustion, and that they are apt to excite gastric irritation, to which there is a distinct predisposition in these cases.

Stimulating embrocations (the compound camphor, mustard, or turpentine liniments) to the chest are useful. A quilted cotton-wool jacket should be worn over the chest, and this we consider preferable to hot poultices, as the jacket admits of the application of liniments, or mustard, or iodine, whereas the wet poultice often gets cold, fatigues by its weight, leads to dangerous exposure in its renewal, and, if unskilfully made or applied, often slips and makes the patient damp and uncomfortable. However, the early application of a mustard plaster over the bases of the lungs has often proved useful, and if there

is pleuritic pain a hot linseed poultice will usually relieve it.

In the *initial* stage, if there is much fever, with a hot, burning skin, a few small doses of tincture of aconite, $\frac{1}{2}$ minim to 2 minims according to the age of the child, every hour or two for three or four doses, with a little acetate of ammonia or citrate of potash, will often allay the fever in a remarkable way, and soothe the little patient greatly. Its use must be limited, however, exclusively to the early stage of the disease. At the same time the bowels should be acted upon by a small dose of calomel. We have not found quinine so invariably useful in this form of pneumonia as in the preceding, but most other authorities speak highly of its beneficial effects in some cases.

It is seldom that the necessity for reducing the temperature arises in an urgent form in broncho-pneumonia. Sponging with tepid or cold water is, as a rule, all that is required. In exceptional cases, immersion of the child for a period of one to three minutes in a bath of 65° to 70° F. may be permitted.

Leeches to the chest followed by poultices have been advocated by some physicians to relieve the dyspnœa attendant on cardiac embarrassment.

Any symptoms of gastro-intestinal catarrh, such as vomiting and diarrhœa or abdominal distension, occurring in the course of the illness, must be promptly relieved, because of their lowering tendency. Careful attention to the feeding of the child is the best means of averting these troubles. If vomiting occurs early in the case, with a furred tongue and confined bowels, two or three small doses of calomel may be given with advantage—$\frac{1}{4}$ or $\frac{1}{2}$ grain, with 2 to 5 grains of bicarbonate of soda, every four or five hours until the bowels have been freely moved. If there is also a tendency to diarrhœa, one or two of these powders may still be given; but should the diarrhœa continue, it will be necessary to replace them by others, each containing Dover's powder, $\frac{1}{2}$ to 2 grains, according

to the age of the child, with 2 to 4 grains of carbonate of bismuth, to be given twice daily until the diarrhœa ceases. Symptoms referable to the nervous system — restlessness, delirium, etc. — may be so severe as to require treatment by sedatives. We have already spoken of the use of opium, and the caution necessary in its administration. Given, as already directed, in minimum doses and in combination with ammonia and ether, it is often valuable in allaying these nervous symptoms.

But the most imperative indication in the more serious forms of this disease is energetically to support the strength of the patient and to overcome the tendency to respiratory failure. In addition to the measures already pointed out, there are still other means to which we may have recourse. Strychnine, as a stimulant to the respiratory centre and to the respiratory muscles, is a valuable remedy in these cases. It may be given in combination with bark, thus :

℞ Strychninæ ... ... gr. ¼.
Acidi hydrochlorici diluti ... ... ʒj.
Spiritus chloroformi ... ... ʒiv.
Extracti cinchonæ liquidi ... ... ʒiij.
Aquæ ... ... ad ʒiv.

Misce, fiat mistura. For a child 5 years of age a teaspoonful (= $\frac{1}{120}$ grain) may be given, in one or two of water, every three or four hours.

In urgent cases larger doses may be given, and preferably by hypodermic injection, so as to ensure a speedy effect.

Inhalation of oxygen may be administered with good effect when signs of asphyxia appear, but to be effectual it must be given long and continuously.

Injection of *normal saline solution* into the subcutaneous tissues is a valuable resource in the presence of threatened collapse.

As cardiac stimulants, *ether* and *caffeine* may be given hypodermically, as already mentioned in treating of lobar pneumonia.

Alcoholic stimulation will be needed in most cases to prevent prostration and maintain the strength. In very young children 10 or 15 drops of brandy or whisky may be given in a few teaspoonfuls of hot milk and water every hour, and this dose may be increased to half a teaspoonful or a teaspoonful for older children. When collapse is threatened, brandy or whisky may be given hypodermically, or, mixed with some fluid food, by the rectum.

The general hygienic surroundings of the patient must be carefully attended to. The air of the sick-room must be raised to a temperature of between 65° and 70°, and, whilst good ventilation is provided, all cold currents of air must be excluded. The diffusion of the vapour of water through the room by means of a steam-kettle should be steadily maintained; and by introducing a small piece of sponge or a roll of blotting-paper moistened with pinol or eucalyptol into the spout of the kettle, an agreeable and useful atmosphere for the patient is produced. So important is the constant attention of a skilled nurse, in the case of a child, that one should be available for the day, and another for the night.

The food must be light and nourishing. For infants milk, suitably diluted, is often all that is required; to older children, good broths, beef-tea, gruel, milk, whipped eggs with milk, or whey may be given. If there should be much gastric irritability, peptonised milk, albumin water, or white-wine whey may be given. If food by the mouth is persistently refused, it may be necessary to feed the child by means of a nasal tube.

The period of **convalescence** must be carefully watched, and tendencies to relapse guarded against.

In the cold and changeable seasons of the year it may be necessary to insist on keeping to the house, choosing, if possible, a warm, airy, cheerful, and sunny apartment. In fine warm weather the child's bed may be moved into an open-air shelter. To promote resolution of the infiltration, the application of iodine

paint, or friction with liniments containing pine oil and iodine, or the linimentum terebinthinæ aceticum, may be found of service. Any residual collapse of the lungs must be dealt with by one or other of the devices used for aiding expansion of the lungs. As soon as the child is well enough it should be encouraged to play and run about in the room. Tonics will be needed to strengthen the circulation and restore loss of power, and help in throwing off the lingering catarrh. One of the best for this purpose is the *hypophosphite of lime* combined with quinine, iron, and strychnine. Arsenic is very useful in some cases, and the arsenical water of La Bourboule we have found particularly valuable, given night and morning in doses of four to eight tablespoonfuls with a little hot milk. Cod-liver oil is most useful in all strumous cases and in cases of defective nutrition. In summer, change to the seaside and cautious bathing with sea-water greatly favour complete recovery, and in older children mountain air is often of very great service, promoting as it does a sort of pulmonary gymnastic, and leading to more complete expansion of the lung. It tends to favour the disappearance of residual deposits and to promote the re-expansion of collapsed portions of lung.

Secondary Pneumonias

These are apt to occur in the course of the acute fevers and in the last stage of many chronic diseases. They are not true pneumonias, but are either "hypostatic" and dependent on passive hyperæmia and collapse, or they are local inflammations, set up probably by the morbid, infective state of the blood associated with the original disease.

There is little to be said with regard to their treatment, which must necessarily depend greatly on the nature of the disease of which they are complications. They are usually associated with a tendency to cardiac failure, and all those measures of active stimulation which we have described as

appropriate to the final stages of the two forms of pneumonia already considered will ordinarily be applicable also here. At the onset of such congestive conditions, warm mustard and linseed poultices are often useful, or hot flannels sprinkled with turpentine. Ether, ammonia, bark, strychnine, alcohol, will be found useful in most cases, administered according to the directions already laid down. Digitalis may also be useful in some instances. But it would be unscientific to attempt to dictate the treatment of one of these secondary pneumonias, apart from that of the coexisting original disease.

Gangrene of the lung.—It happens but rarely that, as a result of pneumonia, a portion of the lung tissue sloughs, and this is evidenced by the expectoration of intensely fœtid sputum and the presence of a horribly fœtid odour of the breath. Gangrene may also occur from the lodgment of septic emboli in the lung, or from other septic or mechanical injury to it. The object of **treatment**, in such cases, in addition to supporting the patient's strength by suitable stimulants, food, and tonics, is to disinfect and deodorise the sputum and the respired air. The use of disinfectants vaporised in steam or sprays and the internal administration of antiseptics, which may be eliminated at the pulmonary surface, are the remedial measures to be adopted. The continuous wearing of the open zinc respirator figured at p. 593 should be insisted on, when practicable. The sponge in it should be kept saturated with eucalyptol, or creasote, or turpentine, or terebene, or a solution of carbolic acid with camphor or iodine in spirits of chloroform. Some of these antiseptics are apt to make the face sore if used continuously; this may be prevented by smearing the lips and around them with vaseline. The patient should also be made to inhale freely, from a steam spray-producer, a spray of a 2 to 5 per cent. solution of carbolic acid twice a day, so as to disinfect more completely the air-passages;

oxygen inhalations have proved useful. The vapour of turpentine or eucalyptol should also be diffused freely through the patient's apartment. Internally, capsules of creasote and cod-liver oil (1 or 2 minims of creasote to 18 of cod-liver oil), or turpentine (5 to 10 minims with 20 or 30 of olive oil), or emulsions (more suitable for children) of these antiseptics in combination with quinine, strychnine, iron, and other tonics, should be given several times a day. Surgical operation with the view of draining the gangrenous cavity or area will only be advisable if the process is circumscribed and superficial.

ADDITIONAL FORMULÆ

Digitalis and ipecacuanha mixture for pneumonia

℞ Digitalis pulveris } āā gr.
Ipecacuanhæ pulveris } xij.
Aquæ, ℥vj.
(Make an infusion, and add)
Aquæ laurocerasi, ʒjss.
Syrupi mori, ℥j.
M. f. mist. A tablespoonful every hour. (*Bamberger.*)

To lower pulse and temperature in same

℞ Sodii salicylatis, ʒjss.
Syrupi simplicis, ʒv.
Aquæ ad ℥viij.
M. f. mist. A tablespoonful every hour. (*Bamberger.*)

Digitalis mixture for pneumonia

℞ Spiritus ammoniæ aromatici, ℥ss.
Extracti digitalis fluidi, ʒijss.
Glycerini ad ℥iv.
M. f. mist. A teaspoonful every three or four hours, to be increased as the case may require. (*Dr. R. J. Bond.*)

Mixture for catarrhal pneumonia

℞ Ammonii chloridi, gr. lxxx.
Syrupi scillæ *vel* senegæ, ʒiij.
Liquoris ammonii acetatis ad ℥iv.
M. f. mist. A dessertspoonful in water every three hours. One or two drops of tincture of aconite may be added to each dose, carefully watching effect.

Another

℞ Ammonii carbonati, gr. xlvi.
Mucilaginis acaciæ } āā ℥ss.
Syrupi }
Tincturæ lavandulæ compositæ, ʒij.
Aquæ ad ℥iv.
M. f. mist. One teaspoonful in water every two or three hours for a child 3 years old. (*Pepper.*)

Another, if respiratory failure threatens

℞ Quininæ sulphatis, gr. xxiv.
Strychninæ, gr. ¼.
Acidi hydrochlorici diluti, ♏xv.
Glycerini, ʒiij.
Liquoris pepsinæ ad ℥iv.
M. f. mist. A teaspoonful in water every three or four hours for a child 5 years of age. (*Pepper.*)

CHAPTER XXVIII

TREATMENT OF PLEURISIES

Classification of Pleurisies according to their Causation, Course, and Results—Bacteriology.

Simple Dry Pleurisies: Symptoms—Latent Apical Pleurisies — *Treatment* — Frequent Tubercular Character — Pleurisies with Sero-fibrinous Effusion—(*a*) Cases with Small Effusions: Leeches — Opium — Counter-irritation —Aperients—Diuretics—Respiratory Exercises—(*b*) Cases with Moderately Large Effusions: Counter-irritation—Mercurial Inunctions—Limitation of Fluids—Change of Air in Chronic Cases—Milk Diet—Diuretics, etc.—(*c*) Cases with Large Effusions: Physical Signs — Thoracentesis — Dangers of Delay—Indications for Operation—Puncture with Aspiration—Apparatus—Method of Operating—Precautions necessary—Accidents and Dangers—Injections of Sterile Air and Adrenalin Solution into the Pleural Cavity—Oxygen Replacement.

Pleurisies with Purulent Exudation, Empyemata: Etiology —Bacterial Influence—Diagnosis—Value of Exploratory Puncture—Modes of Termination—Possibility of Spontaneous Absorption—Vaccine-therapy—Operative Measures—Aspiration—Pleurotomy—Simple Incision—Resection of Rib—Drainage—Irrigation—Submersion—Antiseptic Dressings—Thoracoplasty.

Additional Formulæ.

The therapeutics of inflammations of the pleura are not so greatly dependent on etiological considerations as are those of some other affections; they are more directly concerned with considerations of the severity and course of each particular case; but these, it must be admitted, may depend on the nature of the exciting cause or some preceding constitutional state. And it is necessary to examine briefly the classification of pleurisies, both etiological and clinical.

Pleurisies have been divided into *primary* and *secondary*.

Primary acute pleuritis was at one time referred to chill, and looked upon as related to rheumatic inflammations. But "catching cold" does not of

itself explain the origin of these cases. Cold only prepares the soil for microbic infection, and it is possible that every case of acute pleurisy is due to micro-organisms or their toxins. Many cases of pleurisy are certainly due to the tubercle bacillus, but it is an extravagant conclusion to teach that they are all of this nature, as some French authors do.

There is no difficulty in deciding this question if physical signs of tubercular disease in the lungs or tubercle bacilli in the sputum have been found. But in many cases, in the absence of such evidence, it is very difficult to decide this point.

The pneumococcus is another frequent cause of pleurisy, and is nearly always associated with acute pneumonia.

The streptococcus pyogenes is the organism present in many severe conditions of septic pleurisy. Less frequent organisms are Friedländer's bacillus, staphylococci, and the typhoid and colon bacilli.

Secondary pleurisies may be excited by a variety of causes. They may be *traumatic*, and produced by wounds, contusions, and other injuries of the wall of the chest; they may accompany *diseases of the lungs*, *pericardium*, and *mediastinum*, inflammatory or malignant; they may be due to *morbid states of the blood*, *constitutional* or *infective*, as in *septic* or *uræmic* states, and in the *tubercular*, *rheumatic*, and *syphilitic*.

Pleurisies may also be classified according to their *course* and *results*. They may be *acute*, *subacute*, *chronic*, and *latent*, and the *result* may be an *adhesive* exudation (*dry* pleurisy), causing adhesion of opposed surfaces, or a *sero-fibrinous*, *sero-purulent*, or *hæmorrhagic* fluid exudation (pleurisy with effusion) which may accumulate in the pleural cavity, and vary in amount to almost any extent.

The chief considerations which affect the **treatment** of pleurisies are (1) whether they are *primary* or *secondary*, tubercular or non-tubercular; (2) whether they are attended with *fluid* or *adhesive* exudation (i.e. with or without effusion); (3) whether the effusion

is *sero-fibrinous* or *sero-purulent;* and (4) whether the effusion is *small*, *moderate*, or *large* in amount.

First, with regard to **simple dry pleurisies.** In these cases there is merely inflammatory exudation from the pleura—due to irritation of its component tissues—and adhesion of its opposed surfaces as the usual result.

Some forms of dry pleurisy are almost completely latent, so that dry pleurisy has been said to have "no symptoms," and adhesions of the entire pleural surface have been found post mortem in the bodies of persons who have never been seriously ill.

Attacks of *dry pleurisy* affecting the apex and upper part of the lung, i.e. those parts of the chest which are almost motionless in ordinary tranquil breathing, are much more likely to be "latent"—to pass unobserved—than similar attacks involving the lower and more movable parts of the chest.

Scanty fibrinous exudations in the latter situation are commonly attended with the following symptoms: sharp pain, or "stitch" in the side, on inspiration, or on coughing or sneezing; tenderness on pressure over certain ribs or intercostal spaces; shallow, cautious inspiration, the body being usually inclined towards the side affected; cough may be present or absent; a friction sound, or "pleuritic rub," can be heard on auscultation of the affected side of the chest.

The **treatment** of ordinary uncomplicated cases of dry pleurisy affecting the lower part of the chest and attended by the symptoms mentioned, is simple.

If the **pain,** "the stitch," is very severe, and if the temperature is raised two or three degrees, as is frequently the case, a few leeches applied to the seat of pain, followed by a hot linseed poultice or a hot compress, are usually very efficacious in giving relief.

Some physicians advocate the local application of cold (cloths wrung out in ice-cold water or an ice-poultice) in such cases, but this method is repugnant to many patients. Limiting the movements of the ribs, etc., in breathing, by the firm application

of a flannel roller, or a broad band of adhesive plaster, around the base of the chest, is valuable.

A few small doses of *opium* in combination with mild salines has an excellent soothing and anodyne effect in these cases of pleuritic pain. The following is a good formula :—

℞ Pulveris ipecacuanhæ compositæ... ... gr. v.
Potassii citratis ... ... gr. xx.
Liquoris ammonii acetatis... ... ... ℥ij.
Aquæ camphoræ ... ... ad ℥j.

Misce, fiat haustus. To be taken every three or four hours until the pain is relieved. In rheumatic cases it will be advisable to add 10 grains of salicin or sodium salicylate to each dose.

If pain is very severe, and there is no consolidation of the lung, there is no possible objection to a hypodermic dose of morphine. A night of good sleep at the outset may prove of great value later. *Aspirin* is another remedy of the greatest value for relief of pleuritic pain.

The bowels should in all cases be kept freely relieved by means of 1 or 2 drams of sodium sulphate dissolved in 1 or 2 ounces of warm water the first thing every morning. If the tongue is thickly coated and the urine high-coloured, it will be advisable to give also at night a grain of calomel with 4 grains of colocynth and henbane pill. After the acute pain has disappeared, and if friction sounds are still heard, small flying blisters over the seat of the friction or repeated applications of iodine paint are of use. Some physicians recommend the immediate application of a blister, but we do not think this is desirable, as most cases of dry pleurisy get quickly well with the simple measures here described. The patient should be, of course, confined to his bed, even in the absence of fever, with a view to keeping the side at rest. Provided the patient is protected from any possibility of chilling of the skin, the freest access of air to his room is desirable.

After apparent recovery from the acute attack we

must always keep in mind the possibility of the *tubercular origin of the pleurisy.* If there is any doubt on this point it is best to err on the side of safety, and regard the case as one of *incipient pulmonary tuberculosis,* requiring the full hygienic treatment of that condition for a period of several months at least.

Some cases of dry pleurisy assume a chronic recurrent form and are attended with much thickening of the pleura and a tendency to a fibroid invasion of the subjacent lung which may become contracted and cirrhotic (the *pleurogenic* pneumonia of some authors). A course of potassium iodide, together with the application of iodide paint or friction with the iodide of potassium and soap liniment to the affected part of the chest, often proves of service in these cases. At the same time the respiratory movement should be limited by strapping or bandaging, and physical rest should be enforced during the attack. Between the attacks suitable pulmonary gymnastics and respiratory exercises may be advised to aid in re-expansion of the lung.

The treatment of pleurisies with more or less **sero-fibrinous effusion** must be to some extent determined by the amount of the effusion and the interference with function produced by it.

The amount of effusion in these cases will vary from a few ounces—just enough to give rise to three or four finger-breadths of dullness over the base of the lung—to several pounds, filling up the whole of one side of the chest, compressing and flattening the lung completely, displacing adjacent organs, and causing serious dyspnœa from interference with the respiratory and circulatory functions.

The treatment appropriate to these varying conditions must also vary. We propose to consider—

1. Cases with *small* effusions.
2. Cases with *moderate* effusions.
3. Cases with *large* effusions.

1. The treatment of cases of acute pleuritis with

only a **small** amount of fluid effusion, giving rise to three or four finger-breadths of dullness at the base of one lung, may be conducted on much the same plan as that of acute dry pleurisies.

At the onset of the attack we shall usually find more or less fever, a temperature of 102° to 103° F., and more or less pain in the side; and the indication for treatment is to relieve these symptoms and to *diminish the intensity of the pleural engorgement*, and so prevent the further effusion of fluid or promote the absorption of that already effused. Severe *pain* in the side must be met by the application of six or eight leeches, followed by a hot linseed poultice, and this succeeded by a flannel bandage applied tightly round the chest, so as to limit the respiratory movements. If the pain still continues, flannels or spongio-piline wrung out in hot water, and freely sprinkled with laudanum or opium and belladonna liniment, will be useful. Repeated moderate doses of opium, internally, should also be given to allay the distress of breathing, to calm the patient, and to produce a subjective condition favourable to recovery. It is well, if there is fever, or in cases of a definitely rheumatic character, to combine it with salicin or sodium salicylate and a saline diaphoretic, as in the following formula :—

℞ Extracti opii liquidi	... ...	♏x.
Salicini	... ...	gr. x.
Potassii citratis	... ...	gr. xx.
Liquoris ammonii acetatis	... ...	ʒiij.
Aquæ	... ...	ad ℥j.

Misce, fiat haustus. To be taken every three hours until the pain is relieved.

The constipating effect of opiates should be anticipated by the administration of an initial dose of 1 or 2 grains of calomel, followed by a saline aperient; by thus getting rid at starting of all accumulations in the alimentary canal, we shall have less hesitation in giving opium freely to relieve pain and cough. **Aperients** should be repeated when

required, but we see no good reason for disturbing the patient by frequent purges.

The opium should be discontinued as soon as the pain is relieved. If there is much irritative cough, it may be allayed by giving the patient a morphia and ipecacuanha lozenge to suck from time to time, or the following linctus :—

℞ Tinct. camph. co. ... ...
Oxymellis scillæ ... ...
Syrupi tolutani ... ...
Glycerini ... ... } āā ℥ij.

Take a teaspoonful for a dose.

As soon as the fever has subsided—which will usually be in from two to seven days—**counter-irritation** should be applied over the seat of the effusion.

The best form of counter-irritation is the *"flying" blister ;* i.e. instead of one large blister kept on for several hours over the same spot, repeated small blisters not bigger than a crown-piece are applied in succession to different, but adjacent, parts of the chest over the area of dullness, and kept on from two to four hours, according to the effect produced, which will vary with different patients. By the use of small blisters, retained for only a short time, we avoid any extensive vesication, as well as any renal or vesical irritation in persons prone to cantharidism, and we are enabled to reapply them, after a short time, over the same spot.

By blistering, and by *dry-cupping*, which some employ, we obtain a powerful derivation to the skin, for they both act by dilating the vessels of the skin, and so we help to diminish the over-distension of the vessels in the pleura.

The local application of iodine is a valuable measure, which acts similarly to a blister, and is more convenient in small effusions tending to become chronic.

Of course, while there is any fever the patient must be confined to bed, and kept on a light diet, not,

however, too exclusively a fluid diet, as the drier the diet the more it favours the absorption of fluid effusion. Lightly boiled eggs, bread and milk, boiled sole or whiting, boiled chicken, etc., are all permissible and suitable.

The use of **diuretics** to promote the absorption of the fluid effused has been advocated by some, but little reliance is to be placed on them. Potassium iodide has, however, been found of value for this purpose. Pleural effusions have been reported as rapidly disappearing under the diuretic influence of caffeine combined with sodium benzoate, about 40 grains of each, daily, along with a milk diet.

By measures such as these most cases of ordinary pleurisy with *small* effusion in healthy persons will soon be cured.

Tonics of quinine or bark, together with strychnine or iron, will be useful during convalescence: and full expansion of the lung may be promoted by gentle respiratory exercises. (For description of exercises *see* Additional Formulæ at the end of this chapter.)

2. We have next to consider the treatment of cases with **moderately large** effusion, with percussion dullness extending up to, or a little above, the angle of the scapula.

The same plan and principles of treatment which have just been sketched apply equally to these cases, except that counter-irritation will probably require to be more vigorously carried out and continued longer; and if the effusion lingers long, and shows signs of increasing rather than diminishing, and is uninfluenced by this treatment, and especially if the patient begins to suffer from dyspnœa on slight exertion, or his general health appears to be affected, then, even in the case of moderate effusions, we may wisely have recourse to *paracentesis* for the withdrawal of the fluid, or a portion of it; for it is not uncommon to find the withdrawal of even a small quantity of fluid from the pleural cavity to be followed by rapid absorption of the remainder.

We should, however, be in no haste, in these cases of moderate effusion, to advise paracentesis, for the fluid helps to keep the inflamed pleural surfaces at rest. Well-directed and repeated counter-irritation, sometimes in the form of flying blisters, sometimes in the form of iodine paint, and sometimes, as suggested by Niemeyer, the rubbing into the chest of half a dram of mercurial ointment twice daily, until some slight effect on the gums is produced, will promote the removal of the effusion, and avoid any necessity for an operation, which some sensitive patients dread.

The disappearance of some of these moderate effusions may be promoted by a strict limitation of the amount of fluid consumed: only just sufficient liquid being allowed the patient to prevent his suffering from thirst.

It will not infrequently happen that after a certain amount of the effusion has disappeared the remainder will linger unabsorbed and uninfluenced by any of our remedies; in such cases it is often of great service to prescribe change of air, especially when the season of the year is favourable. Removal to the seaside will in some cases be attended with immediate improvement, or, still better, change to a Swiss *Alpine* resort, where, in addition to the tonic effects of fresh, pure, bracing air, a certain amount of lung gymnastic is induced, will promote the absorption of the lingering exudation and the re-expansion of the lung. If change of air is impracticable, daily exercise in the open air should be insisted upon, and it is well to supplement this with a spell of respiratory gymnastics every day, morning and evening.

3. In the next place, we must consider the treatment of pleurisies with a **large** amount of serofibrinous effusion.

The coexistence of the following physical signs may be regarded as indicative of the presence of a large effusion in the pleural cavity: (1) Visible and measurable distension, with immobility of the

affected side of the chest. (2) Absolute dullness on percussion over a great extent of surface, front as well as back. (3) Absence of vocal fremitus over the dull area, as well as a sense of fullness and absence of elasticity conveyed to the hand placed on the chest. (4) Entire absence of respiratory murmur on auscultation over the greater part of the affected side. (5) Considerable displacement of adjacent organs, of the heart to the right or left, of the liver downwards on the right side, and the spleen on the left.

It must, however, be borne in mind that a very considerable effusion may be present without the coexistence of all these physical signs, and we must, therefore, attend to such evidences as may be furnished by other symptoms, such as great dyspnœa on making even slight movements, cyanosis, evidence of cardiac feebleness, and distension of the right side of the heart—as a small irregular pulse, palpitation on any exertion, scanty high-coloured urine, etc.

We must also bear in mind that the largest effusions are often found in cases in which the symptoms develop slowly and in an almost imperceptible manner.

In the management of large effusions, during the early febrile stage, the same measures may be adopted as we have described as applicable to the treatment of small and moderate effusions, and if we see any signs of diminution in the amount of the fluid effused, we may persevere with these measures, and wait patiently for a further subsidence of the exudation. There is no occasion for alarm or hurry so long as no serious signs of circulatory or respiratory failure make their appearance and no great amount of cardiac displacement is detectable. But if, after the febrile stage has passed away, and at the end of the second week of the illness, there still remain the evidences of a large effusion which shows no sign of diminution, it will be rarely advisable to waste time in further medicinal treatment. While we are by no means disposed to advocate hasty or early resort to *paracentesis thoracis*, especially in cases in which there appears to

be a reasonable chance of removal of the effusion by absorption, we are nevertheless averse from unnecessary waste of time in the application of inefficient measures for the removal of a large effusion, attended with serious respiratory trouble, or of long duration, and which shows no signs of disappearing. The inconveniences and dangers accompanying such delay are not imaginary, while the operation of puncture, with or without aspiration, performed with the precautions and care we shall immediately insist upon, is one of the simplest and safest possible. No doubt the operation when first introduced, and when performed with insufficient care, caution, and skill, was not infrequently attended with certain drawbacks and dangers.

Delay in the removal of some portion of an extensive effusion may be attended by serious results. Not only does it lead to over-distension and enfeeblement of the right side of the heart and hyperæmia of the opposite lung, not only is there some risk by unreasonable delay that the compressed lung may become bound down by firm bands of lymph, or become the seat of fibroid changes, and so be prevented from re-expansion, but the danger of sudden death from displacement of the heart when the effusion is large and situated on the left side must be borne in mind.

As we have already said, we should not be in haste to puncture in recent effusion, even if extensive although early puncture in the febrile stage has had many advocates, and even so careful an observer as Potain has seen no objection to thoracentesis as early as the second or third day; but we do not consider this operation justified during the febrile period, unless the effusion is so large and the interference with respiration and circulation so great as to endanger life; then, of course, there should be no hesitation, and the pleural cavity should be at once punctured, and a certain amount of the effusion withdrawn.

In cases known or suspected to be tubercular we must be more cautious about withdrawing the

effusion. The effusion, "keeps the collapsed lung quiet, which is very desirable if there be any active tuberculosis of lung. A very large proportion of cases of pleurisy are tubercular, and the early withdrawal of fluid causes vascular turgescence of the lung, often hastens the dissemination of tubercle bacilli, and kills the patient."* We have quoted Sir James Barr, as his experience in this matter entirely coincides with our own.

We may conclude, then, that **thoracentesis** is indicated, whether in the *acute* or *chronic* stage, whenever the effusion is so large as to interfere seriously with the functions of respiration and circulation. It is also indicated when the effusion is considerable and shows no tendency to diminution with other methods of treatment; and it is indicated when the effusion has existed so long that there is danger of the lung remaining permanently compressed and inexpansible unless the pressure upon it be removed. The existence of effusion into both pleural cavities may also point to the need of withdrawing a portion of the fluid from one, an expedient which will often be followed by the absorption of the fluid in the other.

When we advocate *thoracentesis* for the relief of pleuritic effusion, we recommend the combination of *aspiration* with *puncture*, in preference to withdrawal by simple *siphon action*. If, however, siphonage is adopted, and the fluid is allowed to flow out under its own pressure, the by-way of the cannula must be fitted with a sufficient length of elastic tubing for the open end to lie in a basin of sterilised water on the floor, to prevent accidental entry of air.

The apparatus necessary for the operation of *aspiration* is quite simple. We need (1) a small trocar or a hollow, sharp-pointed, quill-shaped needle, for piercing the chest; (2) an exhausted receiver—any ordinary bottle or flask will do; (3) an exhausting syringe or pump; and (4) air-tight tubes connecting these. The

* Sir James Barr, "The Bradshaw Lecture," *Brit. Med. Journ.*, Nov. 9, 1907.

use of hollow, sharp-pointed needles is very common in England, but we consider the objection made to them a valid one—viz. that there is a danger, as the lung expands at each inspiration, of its surface becoming wounded or irritated by contact with the pointed end of the needle. The most suitable and convenient form of apparatus for the purpose of thoracentesis is that

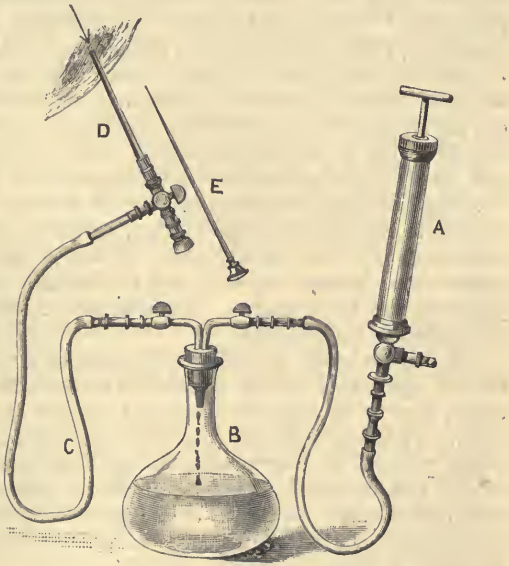

Fig. 16.—Potain's apparatus for thoracentesis.
(For references *see* text.)

known as Potain's. The accompanying illustration (Fig. 16) shows the apparatus in use, and needs little explanation :—

B is an ordinary bottle or flask, in which a vacuum is made by the exhausting syringe A. C is a tube connecting the exhausted receiver with the trocar, which is used for piercing the chest wall, and E is the stylet withdrawn from the cannula D, and which can

be re-introduced should the latter become obstructed during the exit of the effusion.

The trocar and needles vary in size. We prefer the smaller ones, as we greatly object to the rapid evacuation of the fluid, which the larger instruments encourage, and which was, we believe, together with want of sufficient cleanliness, the cause of most of the dangers that have been described as attending this operation. With a small trocar the operation is less painful and less dreaded by the patient. All that can be said in favour of the large hollow needles which we have often seen used is that they save the time of the operator—an unworthy consideration, which should never be allowed to weigh with us—and are less likely to be obstructed with fragments of lymph floating in the pleural effusion. But in Potain's apparatus the cannula can readily be cleared by the re-introduction of the stylet. We have seen the large needles also become blocked, and in that case a fresh puncture has to be made. A trocar with a diameter of $\frac{1}{12}$ inch is large enough.

It is of extreme importance to examine every part of the apparatus before using it—to test the stop-cocks, and to see that the tubes and needles are quite clear. It is also of the very greatest consequence that every portion of the apparatus, and especially the trocar and cannula, should be perfectly aseptic. It was undoubtedly owing to a disregard of antiseptic precautions that to puncture and aspiration was formerly frequently attributed the conversion of a serous into a purulent effusion.

The puncturing part of the apparatus, whether needle or trocar, should be washed with a 10 per cent. solution of carbolic, and afterwards dipped in alcohol and passed through the flame of a spirit-lamp, and some warm 5 per cent. carbolic solution should be aspirated through the tubing attached to the trocar.

Before proceeding to the puncture, we usually give the patient a little hot brandy and water, or a

full dose of sal-volatile. Stimulants should be handy throughout the operation in case of need.

The part of the chest selected for puncture should be cleansed with ether soap, and finally wiped with cotton-wool soaked in an alcoholic solution of carbolic acid.

As to the best place to make the puncture, opinions differ somewhat, but there is a certain consensus of opinion in favour of the axillary region, and the particular intercostal space selected must depend on the amount of the effusion; on the right side, the 5th or 6th interspace, and on the left side the 6th or 7th, may, as a rule, be safely chosen. We are accustomed to introduce the trocar about *an inch in front of the posterior axillary line* and into the intercostal space which lies just below the angle of the scapula, when the arm is advanced and drawn across the chest, as it should be for this operation. This situation has these advantages :—

(*a*) It is easily found.

(*b*) The patient is able to assume a comfortable position, and one convenient to the operator—i.e. raised in bed on pillows, with the arms crossed on the chest.

(*c*) The patient does not see the puncture.

(*d*) If you go nearer the spine the intercostal spaces become too narrow, the wall of the chest is thicker and more difficult to pierce through, and the position is not so convenient to the patient or the operator.

(*e*) You run no risk of wounding any important organ.

You must feel for the depression of the intercostal space with the point of the left index finger. This is somewhat difficult with stout patients. Then, supporting the trocar, which should be previously dipped in carbolic oil, and be grasped firmly by the right hand against the left index, you thrust it quickly and firmly through the intercostal space into the pleural cavity, taking care to avoid the situation of the intercostal vessels and nerves which lie under the lower border of

the rib above. The skin, if it should appear to be very thick and tough, may be divided by a slight cut of a knife, but this is rarely necessary when using a small trocar. In sensitive patients it is advisable to anæsthetise the skin before puncturing, and this is best done by the hypodermic injection into the subcutaneous tissue of a few drops of a 5 per cent. solution of eucaine, or a 2 per cent. solution of novocaine. If the trocar should unfortunately come against a rib, it must be partially or wholly withdrawn and re-introduced.

It is a good plan to tell the patient to take a deep inspiration and hold his breath for an instant when you are about to puncture. The intercostal spaces are thus expanded.

After the introduction of the trocar the stylet is withdrawn and the tap of the trocar closed. At the same time you open the tap connected with the exhausted bottle, and the liquid flows into it from the pleural cavity.

It will sometimes happen that the cannula or needle becomes blocked by a plug of false membrane, which has been sucked into it from the pleural cavity, and which prevents the flow of fluid through the tube. To remove this, the trocar is again passed through the cannula, or, when a needle is used, a blunt-pointed plunger, which is connected with some needles, is passed through the tube of the needle to clear it.

Some think there is danger, in doing this, of introducing air into the pleural cavity, and prefer to make a fresh puncture; but it must be remembered that, trifling as the operation of puncturing the chest may seem to the operator, the patients themselves particularly object to it, and there is always a tendency in the patient's mind to believe there has been some bungling on the part of the operator if the puncture has to be repeated; and if care be taken to have a close-fitting plunger or trocar, well oiled with carbolic oil, and if the apparatus is really well made, there ought not to be any danger, on re-

introducing the trocar, of admitting air into the pleural cavity.

It is not necessary, nor is it usually advisable, to withdraw as much fluid as you can from the pleural sac. Indeed, it is rarely desirable to withdraw more than 50 to 60 ounces at one aspiration. For it has been often observed that when aspiration has been carried to a greater extent than this, the patient, on returning to the horizontal position, has been seized with violent and persistent attacks of cough of the most distressing kind. This is all the more likely to occur if the fluid has been withdrawn rapidly. If it is wished, for any reason, to remove a considerable quantity of fluid at one aspiration, it should be done very slowly and with interruptions, so as to allow of a gradual return of the compressed lung to the altered physical conditions.

We have always been in the habit of terminating the aspiration at once if, after the withdrawal of a certain amount of liquid, the patient begins to have a troublesome cough or to complain of severe pains within the chest. It is certainly most undesirable to remove a large quantity of fluid very rapidly, so as to expose the previously compressed and displaced viscera to suddenly altered physical conditions, i.e. to a high degree of negative pressure ; by using a fine trocar, and by occasionally interrupting the outflow by compressing the tube connected with the pleura, we avoid a too sudden disturbance of the pre-existing physical conditions within the chest. It has also been observed that profuse *expectoration of albuminous fluid* sometimes follows a too rapid removal of a large mass of fluid from the pleural sac, and this has been shown to be due to sudden congestion of the previously compressed lung, the vessels of which may well have lost some of their tone and natural physical properties, after long compression, so that on the sudden re-entrance of blood into them some of its albuminous constituents are allowed to escape through the vascular walls.

In the case of pleural effusion complicating pneumonia it is most important not to withdraw a large amount of fluid, as pneumothorax has been known to occur under these conditions, the lung, softened by the pneumonia, rupturing in the process of dilatation on withdrawal of the fluid.

In certain rare cases of sudden death after aspiration, this has been thought to be caused by sudden cerebral, and especially bulbar, anæmia, due to the afflux of blood to the hitherto compressed lung. It is a good plan to give the patient a little brandy and water before the operation, and to repeat the dose, or, if necessary, give some ether and ammonia during the operation, especially if any feeling of faintness is complained of.

Having withdrawn the necessary quantity of fluid, the cannula or needle should be removed gently, compressing the skin around it with the fingers as you do so, so that no air may enter the chest; and then a pledget of lint, dipped in collodion, should be at once applied over the puncture, and covered with another fold of lint, which is fixed with a strip or two of adhesive plaster; a flannel bandage should then be applied tightly round the chest.

We have been accustomed to apply, after aspiration, a broad piece of adhesive plaster very firmly round the affected side, so as to restrain as much as possible the respiratory movements of the chest wall and keep the lung at rest, and to prevent any unpleasant effects after the operation.

A portion of the effusion having been removed by aspiration, not infrequently the remainder is absorbed; or the level of the fluid in the pleura may remain stationary; and in order to promote its absorption we may have to employ counter-irritants in the manner already described in speaking of the treatment of small and moderate effusions (pp. 697, 699).

Or the fluid may slowly re-accumulate and necessitate another aspiration. But if the fluid re-accumulates rapidly, it must be borne in mind that

its re-accumulation may be due to the fact that the compressed lung is bound down by permanent bands of false membrane, and cannot expand when the fluid is withdrawn. In that case, to continue withdrawing the fluid by aspiration would simply exhaust the patient, as we should be repeatedly draining off the serum of the blood into the pleural cavity.

It is advisable, before resorting to aspiration, to make sure that the diagnosis is correct, as well as to ascertain with certainty the nature of the exudation we have to deal with. For this purpose an exploring puncture should be made with a hypodermic syringe, provided with a rather long and stout needle. After carefully cleansing the needle with carbolic solution, it should be introduced into the chest (the surface of which has also been made aseptic) below the level of dullness, and if then the piston of the syringe be drawn up, the barrel of the syringe will become filled with fluid, and you can see whether it is serous, or purulent, or hæmorrhagic. The working of the syringe must be tested beforehand, or the test may fail simply from the defective condition of the syringe.

If after aspiration the patient is troubled with cough, small doses of morphine—$\frac{1}{24}$ grain in half an ounce of chloroform water—should be given every hour or two until the symptom is relieved. Warm milk and seltzer or Apollinaris water, with a little brandy or whisky, every few hours, will also contribute to relieve this cough, which is probably often due to the presence of a little adhesive tenacious mucus in the long-compressed bronchi.

Much was written formerly about the dangers attending the operation of thoracentesis. We have already alluded to one of these, viz. the occurrence of *albuminous expectoration*. This occasionally assumed serious proportions, and was due to intense congestion of the previously compressed lung. This accident was undoubtedly caused by the too rapid withdrawal of too great an amount of fluid ; and, as

has been urged by Dieulafoy and other experienced physicians, it is of the greatest importance not to withdraw large amounts of fluid at one sitting, especially in old cases where the lung has been long compressed.

Other dangers or accidents cited by authors are: wounding the intercostal vessels, injury to the rib, puncture of adjacent viscera, liver, spleen, and heart, failure to withdraw fluid owing to plugging of needle, admission of air and conversion of a serous effusion into a purulent one, production of serious paroxysms of cough and severe intrathoracic pain; all these dangers and accidents may be avoided, as we have shown, by caution and care in the performance of the operation and proper attention to the fitness of the instruments employed.

In the Bradshaw Lecture at the Royal College of Physicians, in November, 1907, Sir James Barr described a method of treating pleural effusions which he has adopted and to a certain extent originated. We propose to describe it chiefly in his own words.

He calls it the systematic treatment of pleural effusion by the combined method of the complete withdrawal of the liquid and the introduction into the pleural sac of adrenalin and sterile air. His idea was that if he "substituted another fluid, say air, for that which was withdrawn," he would lessen or prevent subsequent adhesions taking place. Another advantage would be that in elderly people with rigid chest walls, "if there be a large collection of fluid and the whole of it be withdrawn, there is great risk, from the sudden diminution of pressure, of collateral hyperæmia and œdema of the healthy lung, which in not a few cases have led to rapid death." This risk is entirely obviated by the injection of air, part of which may be injected, say, when half the liquid is drawn off. The air rises to the surface, and hence it is very easy to re-establish the siphon (which he prefers to the aspirator) and draw off the remainder of the liquid. You can then inject

the adrenalin and more air. "I can now remove the whole of the effusion, even in tubercular cases, at an early stage, with impunity. But before any great negative pressure is established I stop the siphon and introduce about an equal quantity of air to the amount of fluid I have withdrawn. I then re-establish the siphon and complete the withdrawal of the effusion. When all the liquid is withdrawn I inject 4 c.cm. of adrenalin solution (Parke, Davis & Co.'s adrenalin chloride solution, 1 in 1,000) diluted with 8 or 10 c.cm. of sterile normal saline, and if I think it necessary I introduce more sterile air, so as to make the total amount equal to half or three-quarters of the bulk of fluid withdrawn; the larger quantity of air is introduced in tuberculous cases. . . . The adrenalin solution is introduced to contract the blood-vessels and lessen the secretion . . . When the use of adrenalin is supplemented by the introduction of air, negative pressure is lessened or abolished, and the lung gradually expands as the air gets absorbed.

"By this combined method you can operate early in any case, even during the febrile stage, and under no circumstances should you allow the fluid to re-accumulate to such an extent as completely to collapse the lung; you should tap before the patient suffers any respiratory distress. By the removal of the effusion you often remove an enormous number of micro-organisms, and by the introduction of sterile air you substitute a light, innocuous fluid for a heavy and deleterious one. . . . I was led to adopt this method by the distress frequently caused to the patient by any attempt to withdraw all the serum; by the usually rapid re-accumulation, especially when there was any negative pressure left in the pleura, or there was a large potential or actual cavity owing to the lung being so collapsed or bound down that it could not expand; by the great risk of collateral hyperæmia and œdema of one or both lungs, especially in those persons with rigid chest walls; and by

the fact that in tuberculous cases there is apt to be a rapid dissemination of tubercle through the lung when the pleural pressure is removed. As four-fifths of the air is nitrogen, which is only slowly absorbed, this air-pad tends to prevent or lessen pleural adhesions."* Morriston Davies† has described a modification of Barr's procedure, in which oxygen is introduced into the pleural cavity in place of atmospheric air. The more rapid absorption of the oxygen might be of advantage in some conditions. The technique of his method, which is fully described, is certainly preferable to that of Sir James Barr. We have found the injection of adrenalin solution excite considerable pain.

One of the earliest of Continental physicians to introduce air into the pleural cavity for curative purposes was Professor Potain, of Paris, in 1888. The case in which Professor Potain successfully injected sterilised air into the pleural cavity was one of pyopneumothorax, and his object was to keep the lung compressed until the pleuro-pulmonary fistula had healed and to prevent the re-accumulation of fluid.

The treatment of **purulent effusions** must next occupy our attention.

This form of pleuritis is far more common in childhood than in adult life. It often occurs then as a complication of broncho-pneumonic attacks in association with measles or scarlet fever, or other infective maladies: it is less common as a sequel of lobar pneumonia. It also occurs sometimes in the puerperal state, and is not rarely dependent on pulmonary tuberculosis. It may have a more or less obvious local origin, as from abscess in the chest wall, due to disease of bone opening into the pleural cavity; or the same may happen with an hepatic abscess or a hydatid cyst; or it may be associated with intrathoracic cancer. It would seem at times

* The apparatus for this treatment is supplied by R. Sumner & Co., 50A, Lord Street, Liverpool.

† *Lancet*, Dec. 28, 1912.

as though merely a low, depressed state of the general health determined the purulent transformation of a pleuritic exudation, so that it may result in this way from a primarily sero-fibrinous effusion.

It has been maintained that *primary* purulent pleuritis is extremely rare, and that in almost every case the effusion is at first sero-fibrinous, and becomes, for some reason or other, subsequently purulent.

Modern bacteriological research traces the origin of purulent pleural exudation to the influence of pyogenic micro-organisms. The sero-fibrinous exudations, it is said, are the result of the action of non-pyogenic micro-organisms, whereas the sero-purulent exudations are determined by the presence of pyogenic bacteria; or both kinds may be present, giving rise to a mixed infection.

Purulent pleuritis may, we are also taught, vary in its characters and tendencies, and, therefore, in the therapeutic measures most suitable for its relief, according to the particular variety of pyogenic microbe associated with its origin.

The cases most amenable to treatment are those —and they are the great majority—caused by the pneumococcus; they are usually connected with attacks of pneumonia; the pleuritic effusions of childhood are most frequently of this kind. This micro-organism is comparatively benign in its tendencies, and simple *aspiration* is often sufficient to effect a cure of the empyemata caused by it. The physical characters of this exudation are the following: it is *fibrino*-purulent, having a large quantity of fibrin in suspension in the form of flakes or false membranes; it has a slightly greenish tinge, is odourless and is more fluid than ordinary pus.

The *streptococcus pyogenes* appears to be the most common cause of empyemata in adults. These micro-organisms have a progressively destructive tendency; and such empyemata are never spontaneously absorbed but must be treated by free incision and drainage, with strict antiseptic precautions. This form of pus is found

in the empyemata associated with infective diseases, scarlet fever, measles, pyæmia, etc., or which follow the puncture of sero-fibrinous effusions with instruments that are not aseptic. It is usually of a greenish creamy aspect, thicker than the preceding, and may be darkened almost to a chocolate colour by an admixture of red blood-corpuscles. Then there are the *putrid* and *gangrenous* varieties, due to the presence of *saprophytic* organisms, and easily recognised by their odour and aspect; these forms require not only aseptic *pleurotomy*, but also *antiseptic irrigations*.

Finally, there is the *tubercular* variety, characterised by the presence of Koch's bacillus. This form of pus is not easily identified, especially as it may also contain pyogenic micro-organisms, and a search for the tubercle bacillus is more often unsuccessful than successful.

Are there any signs or symptoms by which we can determine that a pleuritic exudation is purulent?

The physical signs are the same as when the effusion is sero-fibrinous, but it is commonly stated as a mark of distinction that in cases of empyema there is œdema of the wall of the chest; this, however, is certainly as often absent as present in such cases. Greater intensity and longer duration of pain are also said to distinguish purulent and tubercular from serous effusions.

Better and more reliable evidence is the continuance of fever, which assumes a hectic type. When the subject of an effusion into one or other pleural cavity continues to present the symptoms of a certain type of fever—a temperature, with considerable diurnal fluctuations, rising in the evening and falling towards the morning, together with occasional shiverings and sweatings, a hectic flush on the cheeks, or an unhealthy, muddy complexion, with loss of appetite, emaciation, etc.—in such a case we may justly suspect that the effusion is purulent. Examination of the blood may reveal a pathological leucocytosis. If any doubt remains in our minds as to the nature of

the effusion, it can be readily removed by a simple exploratory puncture by means of a hypodermic syringe: the fluid removed is submitted to microscopical and bacteriological examination.

This simple and almost painless means of establishing our diagnosis should always be employed.

It is as well to make the exploratory puncture, unless there should be any reason to the contrary, in the same spot that will be afterwards selected for the radical operation, should this be ultimately required.

Before we consider the best means of dealing with such an effusion, it may be as well to inquire what happens when such an effusion is left to itself.

In the first place, it may cause a condition of profound septicæmia, with septic complications in other organs, leading slowly but surely to a fatal issue.

In the second place, it may cause necrosis of a small portion or spot of the pulmonary pleura, and so lead to a communication between the pus in the pleura and the air-passages, through which the pus may from time to time be discharged in large or small quantities.

In such a case a fit of coughing will sometimes be accompanied by a profuse discharge of pus from the pleural cavity through the air-passages. If this pus has an offensive putrid odour, it shows that air has probably passed into the pleural cavity from the lung through the necrosed spot in the pulmonary pleura, and that a pyopneumothorax has become established. If the pus expectorated is sweet, it shows either that the opening into the lung is of such a nature that, although it admits of the passage of fluid from the pleura to the air-passages, it does not admit of the passage of air from the air-cells into the pleura, or that, as Lord Lister maintains, the cilia of the air-passages are able to prevent the entrance of putrefactive organisms into the deep portions of the lung.

It is possible for an empyema to become cured by such a mode of termination, but such an occurrence is extremely rare.

In the third place, the *pus* may, after necrosis of a portion of the pleura costalis, penetrate between the muscles of the thorax and point externally, appearing under the skin as a tumour of variable size, usually near the sternum, about the 4th interspace, where the wall of the chest is thinnest. If this burst, the external opening is found usually to communicate by a fistulous tract, which may be three or four inches long, with the opening in the pleura. Through this opening pus will continue to discharge for years, and often gives rise to caries of the ribs. In either of these modes of discharge of an empyema a fatal termination may almost certainly be ultimately looked for, probably after many years of illness and suffering.

These are the cases in which we encounter such remarkable deformity of the chest and spine, owing to slow and continued retraction of the walls of the pleural cavity.

There is, however, a fourth mode of termination certainly possible in very young subjects, and that is disappearance of the effusion by *absorption*. This has been occasionally observed in the pneumococcal pyothorax of childhood, but it is a rare occurrence; indeed, it never occurs when streptococci, staphylococci, or tubercle bacilli are present in the morbid exudation, owing to the resistant vitality of the pyogenic bacteria.

What **treatment** should be adopted in dealing with these cases of purulent effusion into the pleural cavity?

In the case of young children, when the effusion is moderate in amount, and the general health is fairly well maintained, we must bear in mind the possibility of spontaneous cure by absorption, and not be in a hurry to adopt operative measures; especially if, on examination of a portion of the pus withdrawn by

exploratory puncture with a hypodermic syringe, we find that it is caused solely by the presence of pneumococci, and that there is an absence of pyogenic organisms. A vaccine may then be prepared from the patient's own organism, and administered. If, however, there is not clear evidence of absorption in the course of a week or two we should proceed to aspiration in the case of a pure pneumococcal effusion, or open incision in all other circumstances.

If the empyema has communicated with the air-passages, and pus is being expectorated, and that pus is sweet, not offensive, it is well to wait for a time and see if we can effect a cure without operation. Several cases have been recorded in which the purulent expectoration has subsided after inoculation with an autogenous vaccine. Failing this we have no resource left but surgical operation.

What kind of operative procedure should be adopted?

In the case of children it is advisable to remove the pus once by aspiration. In several instances aspiration in children has been followed by cure.

Aspirate then *first* in young subjects, and examine the fluid removed. If other organisms than the pneumococcus are present, proceed without delay to open incision. The tubercular character of the effusion should be no objection to this procedure. There is a distinct advantage in aspirating, at least once, before having recourse to incision, for the pleural surfaces, which by this measure are brought into contact, may become adherent to some extent, and the adhesions thus formed between the pulmonary and costal pleura contribute to a favourable result after incision, as they leave a less extensive suppurating surface of pleural membrane.

It has also been pointed out that, even in cases where it is intended to proceed almost immediately to opening the chest, it is advisable, if the effusion is a large one, to aspirate forty-eight hours before the chest is opened. This leads to an immediate improvement

in the general condition of the patient and enables an anæsthetic to be given with more confidence, and when there is great cardiac displacement it tends to remove the danger of fatal syncope from the too rapid withdrawal of a large collection of fluid.

In the rare instances of *double empyema* it will sometimes be necessary to incise one, while the other is dealt with by aspiration as a temporary measure. Though patients may recover from open incision of each pleura, at intervals of a few days, the risk of the procedure is too great to justify its adoption.

In a very great majority of cases of empyema it will be necessary to make a free opening, with strict antiseptic precautions, into the pleural cavity (pleurotomy), through which the pus may be discharged and free drainage of the pleural cavity maintained.

The next question that arises is, Where is it best to make that opening? And then another question: Is it best simply to make an incision through an intercostal space or to remove a portion of a rib?

The axillary region is a convenient one for this operation, as it involves no disturbance of the patient's position when sitting up in bed; it is also convenient for the introduction and removal of the drainage-tubes, and it is not pressed upon when the patient lies down, as an opening farther back would be.

If a portion of rib is excised, the 6th, 7th, 8th, or 9th, according to circumstances, may be selected, in the mid-axillary line.

It is advisable to avoid making an opening too low down, as the diaphragm soon rises and comes into contact with the wall of the chest, and so might interfere with efficient drainage.

If, as occasionally happens, an accumulation should form at the base, a subsequent incision may be made behind, in the 10th or 11th interspace.

If a spontaneous opening has already been made by the pus working its way to the surface of the

chest, it is advisable to make use of it, but if in the front of the chest time would probably be saved by making a counter-opening behind and passing a tube through.

The advantages gained by excising a portion of a rib are these : in the first place, you obviate an inconvenience that sometimes arises from simple incision when the intercostal spaces are narrow, for as the chest wall falls in they become still narrower, and you may find, after a time, that it is impossible to introduce a drainage-tube. Secondly, by excising a portion of a rib you are enabled to explore the pleural cavity with the finger, and sometimes dislodge large masses of curdy material, and secure efficient drainage throughout the progress of the case.

Simple incision is usually sufficient in children, and in some recent cases for adults, but in chronic cases, in which the lung is bound down by adhesions, and is not likely to expand readily, or where contraction of the chest has brought the ribs close together and narrowed the interspaces, or where preliminary aspiration shows the pus to be putrid, resection of a portion of one or more ribs should be determined on.

But when the intercostal spaces are wide, and when the incision is made in the front of the chest, a simple incision in an intercostal space is usually adequate for the purpose.

In making a simple incision, perhaps the best situation to select is the 8th or 9th intercostal space on the left side, and the 7th or 8th on the right, just in front of the posterior axillary line. The skin in this region must be thoroughly cleansed and disinfected. The skin is best prepared by thoroughly washing with warm water and German green soap, then ether or alcohol is used to remove the fatty matter, and finally a hot sterilised towel, steeped in 1-in-1,000 sublimate solution, is laid over the seat of operation.

The hands and nails of the operator should be scrupulously cleaned and brushed in the manner recommended for the patient's surface. The instruments

should be dipped in a porcelain pan containing 5 per cent. carbolic solution. Treves advises chloroform as an anæsthetic, and in children it is practically impossible to operate without a general anæsthetic; but in certain cases in adults, where there is much exhaustion, and simple incision only is intended, local anæsthetics may be safer. "An incision from $1\frac{1}{2}$ to 3 inches in length is made transversely, so as to correspond to the upper border of the lower rib bounding the space. The intercostal muscles are divided close to the rib; a director is then gently thrust through into the pleural cavity; the opening made is subsequently enlarged with dressing forceps and the finger. . . . The pus, if considerable, should be allowed to escape slowly. The abscess cavity may be examined with the forefinger as the fluid is escaping, or after it has been entirely evacuated. All thick curdy material within reach of the finger should be removed."* A *short* length of common drainage-tube, which should be large and not too stiff, should be introduced and kept in during the earlier days of after-treatment. "Later, when the cavity is contracting, a bent rubber tube, like a soft tracheotomy cannula, answers the purpose." The drainage-tube must be carefully secured from slipping into the pleural cavity. For this purpose it may be provided with a shield like a tracheotomy tube, or a tube folded upon itself and transfixed with a long safety-pin, as figured here (Fig. 17), has been found useful in children's cases;† the pin can be firmly fixed to the wall of the chest by a strip of adhesive plaster.

Fig. 17.—Cabot's folded drainage-tube for empyema in children.

After fixing the drainage-tube securely, the skin is cleansed, the wound dusted

* Treves: "Operative Surgery."

† Keating's "Cyclopædia of Diseases of Children."

with iodoform, and several layers of antiseptic gauze are applied. An oil silk or waterproof protection is placed over this, and the whole secured by a bandage. Frequent change of dressing (twice daily) will at first be needed.

In some cases a counter-opening may have to be made lower down.

The drainage-tube must, in adults, be retained in the pleural cavity until the discharge has almost ceased. If after its removal there should be any signs of re-accumulation, it must be at once re-introduced.

When a portion of a rib is to be excised for the reasons we have already stated, it is first bared of periosteum in order to avoid the intercostal artery, and while steadied with forceps it is divided in two places about 1 or $1\frac{1}{2}$ inches apart with a fine saw. "The section may be completed with cutting forceps, but any attempt—especially in adults—to divide the entire rib by forceps is to be deprecated. By such division the bone is unduly crushed and splintered."*

The sac of periosteum is then cut away and the intercostal artery secured. The operation is terminated as in the case of simple incision.

Senn makes some sound practical observations on this matter. He says:—

"A great deal of information is gained, as soon as the incision into the chest has been made, in reference to the expansibility of the lung. If this has not been much impaired the pus will escape with much force, especially during inspiration. Rapid evacuation is attended with some danger from over-distension of the heart and vessels in the lung, and must be guarded against by interrupting the flow from time to time by inserting the index finger into the opening. If the lung expands promptly, its lower margin can often be seen through the opening towards the end of the evacuation. The more the lung expands, the less the

* Treves: "Operative Surgery."

amount of air rushing through the opening into the chest. In order to prevent syncope upon the sudden diminution of intrathoracic pressure during the evacuation of the pus, I have been in the habit of administering, before the anæsthetic is given, $\frac{1}{100}$ grain of atropine with $\frac{1}{8}$ grain of morphia hypodermically, with an alcoholic stimulant by the mouth or rectum. If, as is often the case, the pleura is lined with thick, partially detached membranes, these should be removed with a dull curette, as they are invariably infected with pus microbes, and their presence in the pleural cavity would prolong infection and retard recovery."

It used to be a common practice to wash out the pleura after pleurotomy, but far greater circumspection is now observed with regard to this practice, which has been shown to be not without danger. It is superfluous in the absence of fœtor and of saprogenic organisms, and it is useless when there exists a bronchial fistula. It should be reserved for the putrid forms of empyema, and those in which extensive false membranes are found adherent to the pleural surfaces. The following fluids have been suggested as quite harmless for this purpose: Boiled water filtered, with a teaspoonful of common salt to each pint; Thiersch's solution of 2 parts of salicylic and 12 of boric acid to 1,000 of sterilised water; Labarraque's solution of chlorinated soda, 1 in 15 or 20 of water; a 10 to 50 per cent. solution of peroxide of hydrogen; a solution of acetate of alumina, 1 to 5 per cent. Care must be taken that the solution is of the same temperature as the body, and the irrigation should always be made with a small, steady siphon stream, and with a *free outlet.*

Irrigation by submersion has been adopted in America by S. A. Adams in empyema in children. The child is placed in a bath of boiled water at a temperature of 100° F. for fifteen minutes — the temperature being kept constant during this period by additions of warm water. "With every inspira-

tion the water would run into the two openings, and with expiration it would return laden with pus, which would sink to the bottom. The entire body was kept under water until expiration expelled clear fluid. . . . Sixteen baths were given, extending over three weeks." This mode of irrigation is said to be very thorough and very comfortable to the patient. It is, of course, only applicable to cases in which there are an opening or openings of sufficient size to allow of free ingress and egress of the water. Fuller cleansing will be obtained by adding 2 drams of liquor iodi fortis to each gallon of bath water.

As we have already said, great attention must be paid to securing the most perfect antisepsis in dressing the wound, and this must be maintained throughout the whole period of healing. The average duration of treatment after operation has been estimated at four months in adults and two months in children.

Much quicker recoveries are, however, common. One of the most rapid we remember was a chronic case in a man of middle age, in which there existed a bronchial fistula, with a periodical discharge of large quantities of pus by the mouth. Pleurotomy was performed by Lord Lister, with resection of a portion of a rib, and the patient was quite well within three weeks!

In some chronic cases we find that, after the pus has been evacuated and the pleural cavity drained, the lung does not expand. It is bound down permanently by adhesions, and there is no chance of the pleural surfaces coming together, so that a fistulous opening remains in the chest, communicating with the pleural cavity, and constantly discharging pus.

To remedy this state of things, the operation of **thoracoplasty** has been carried out by Estländer, Schede, and many others; this has for its object the obliterating of this cavity by the resection of a number of ribs on the affected side. The operation has to be specially devised for and adapted to each

individual case, and its extent must depend on the situation and extent of the cavity which has to be closed. The operation is necessarily a severe one, and is usually attended with considerable shock.

ADDITIONAL FORMULÆ

Diuretic to promote absorption of pleuritic effusion

℞ Caffeinæ, gr. xl.
Sodii benzoatis, gr. xl.

M. et divide in pulv. viij. One in a little water every three hours with milk diet. (*Comby.*)

For acute pleurisy in the adult

℞ Morphinæ hydrochloridi, gr. jss.
Quininæ sulphatis, gr. xxij.
Sacchari albi, gr. lxxx.

M. et divide in pulv. xij. A powder every three or four hours. (*Bamberger.*)

Mixture for the same

℞ Pulveris ipecacuanhæ, gr. xij.
Pulveris digitalis, gr. xij.
Aquæ ferventis, ℥vj.
(Infuse for a quarter of an hour and add)
Potassii acetatis, ʒiv.
Oxymellis scillæ, ʒv.

M. f. mist. A tablespoonful every two hours. (*Bamberger.*)

Diuretic mixture for pleurisy in the adult

℞ Potassii acetatis, ℥ss.
Tincturæ cinchonæ compositæ, ℥ss.
Decocti cinchonæ ad ℥viij.

M. f. mist. Two tablespoonfuls every six hours. (*Fräntzel.*)

For pleurisy in debilitated persons with anæmia

℞ Ferri carbonatis saccharati, gr. xij.
Quininæ sulphatis, gr. xij.
Sodii bicarbonatis, gr. lxxx.
Sacchari albi, gr. lxxx.

M. et. divide in pulv. xij. A powder three or four times a day. (*Bamberger.*)

For pleurisy with effusion in children

℞ Potassii acetatis, gr. xx. ad lx.
Syrupi simplicis, ʒiij.
Infusi digitalis ad ℥jss.
Aquæ, ℥jss.

M. f. mist. A teaspoonful every two hours.

Or

℞ Potassii acetatis, gr. xx. ad lx.
Syrupi aurantii, ʒiij.
Decocti cinchonæ ad ℥iij.

M. f. mist. A teaspoonful every two hours. (*Widerhofer.*)

Corson's paint for counter-irritation in chronic pleural exudation

℞ Olei tiglii, ʒij.
Ætheris, ʒiv.
Tincturæ iodi compositæ ad ℥ij.

M. f. pigm. To be painted over the affected part every morning.

SPECIAL BREATHING EXERCISES FOR EXPANDING COLLAPSED LUNG

(*Used by* DR. E. B. CLAYTON *in the wards of King's College Hospital*)

1. The patient is seated with hands on hips. Bending his body sideways towards the healthy lung, he takes a deep inspiration. Next, during expiration he returns to the upright position.
2. Again seated with hands on hips, he rotates his body first to the right and then to the left, taking several deep breaths in each position.
3. Still seated in the same position, he bends his body forwards as far as he can, and takes a deep inspiration while returning to the upright position. This exercise is repeated with the body rotated first to the right and then to the left.
4. Standing with arms by his sides, and palms of the hands facing inwards, he carries his arms forwards and upwards above his head, taking a deep inspiration while so doing, and being careful to keep the hands farther apart than the shoulders. The arms are then carried outwards and backwards until they are parallel to the ground, the palms of the hands being now upwards. The hands are pronated, and the arms are slowly lowered to the sides during expiration.

PART IV.—PHTHISIS, OR CONSUMPTION (PULMONARY TUBERCULOSIS)

CHAPTER XXIX

INDICATIONS AND PROPHYLAXIS

Definition—*Indications for Treatment*—Prophylactic Measures—Avoidance of Unsuitable Marriages—Measures to be enforced on those with Hereditary Predisposition—Management of Infancy and Childhood—Of Dentition and Puberty—Value of Sea-air and Sea-baths—Tendency to Emaciation to be checked—Catarrhal Attacks to be guarded against—Utility of Pulmonary Gymnastics—Avoidance of Unhealthy Occupations—Measures for preventing Dissemination of the Infective Germs—Risks of Re-infection—Disinfection of Sputum, Linen, Apartments, etc.—Compulsory Notification.

PULMONARY tuberculosis, or "consumption," is an infective disease, originating in the introduction into the lungs of a specific infective organism, the development and spread of which depend on its encountering a suitable soil or an inherited predisposition for its culture and growth, or defective resisting power owing to a depressed state of the organism or of its defensive system.

The impairment of nutrition which we encounter in this disease, when it has not pre-existed as a determining cause, is a consequence mainly of the development in the lungs of the *Bacillus tuberculosis* and other micro-organisms, and the toxins they secrete.

The essential **indications for treatment** in pulmonary consumption are the following:—

1. To prevent or amend those faults of constitution, organisation, and development which predispose to the acquirement of the disease.

2. To prevent or cure those local pulmonary affections which may induce a tendency to this

disease, even where no special constitutional predisposition exists.

3. To prevent the spread of the disease by the conveyance of its germs from those who are infected to others.

4. To endeavour, if possible, to antagonise the morbid influences of the infective organisms on the lung tissues and on the constitution. To attempt to hinder the extension of the disease to the sound parts of the affected lung, and also to the sound unaffected lung, and to prevent the infection of other organs.

5. To lessen and remove the fever and other constitutional disturbances dependent on the infection of the system, as well as on local inflammation.

6. To lessen and arrest the catarrhal inflammatory and degenerative changes excited by the infective organisms in the lungs.

7. To improve the defective nutrition and strengthen the defensive power of the organism by all the resources at our command—regiminal, medicinal, and climatic.

8. To relieve the various distressing symptoms and remedy the several serious complications which occur in the course of the malady.

And, first, with regard to **prophylactic treatment.** The prevention of pulmonary consumption may be regarded from three principal points of view: (*a*) the prevention of the transmission of the phthisical disposition or tendency from parent to offspring; (*b*) the prevention of the development of the disease when the predisposition exists; (*c*) the prevention of those unhealthy conditions, habits, and circumstances of life which are known to favour the acquirement and propagation of phthisis; and (*d*) the prevention of the transmission or communication of the infective bacillus from the sick to the sound.

(*a*) The hereditariness of the tendency to phthisis, apart from the increased risk of infection, has been placed beyond doubt, but from the point of view of prophylaxis it is important to remember that

by the hereditary nature of phthisis we do not mean that phthisical parents convey to their offspring a constitution which must necessarily, at a given period of life, develop tubercular disease, but rather that they transmit to their children an organisation which renders them less able than others to resist infection by the tubercle bacillus.

Marriages between persons who are known to inherit this tendency should be discouraged, and, of those actually infected, positively forbidden.

(*b*) Next, as to the best means of preventing the development of phthisis in those persons in whom a tendency to that malady is known to exist.

An infant born with such a tendency will require the most careful management. On no account should a mother with phthisical tendencies be allowed to suckle her offspring. There is danger in this to both mother and child. For such infants a vigorous and healthy wet-nurse should be selected, and they should be brought up in the free open air of the country, rather than in the confined atmosphere of crowded cities.

The chest and limbs should not be cramped by any tightly fitting garments, but allowed perfect freedom of movement. The nurse should be particularly cautioned against permitting awkward attitudes which tend to compress the chest and to hinder its free expansion.

Attempts should early be made to ward off that morbid sensitiveness and vulnerability of the cutaneous surface so common in those predisposed to phthisis, which is, in a measure, the index of bronchial sensitiveness and irritability. We should, even in the early months of infant life, adopt mildly bracing measures, which may afterwards give place to a more vigorous hardening system. For this purpose, it is a good plan, after the child's morning bath, to sponge over the surface of the body rapidly with cold sea-water, or water containing sea-salt, to which a tablespoonful or two of spirits of wine or eau-de-

Cologne have been added. This process has a bracing and invigorating effect, especially stimulating to the functions of respiration.

When it is impracticable to obtain a wet-nurse, the child should be given perfectly fresh cow's milk of known and reliable purity, boiled, slightly diluted with water, and with a little sugar of milk added. At the period of teething a little beef-juice may be added to the milk; and if dentition be tardy or difficult, some preparation of lime is useful.

More than ordinary care is needed in watching these children through the common ailments of childhood, especially measles, whooping-cough, and scarlet fever. Measles and whooping-cough are especially dangerous to such children, for the catarrhal and congestive attacks of the respiratory organs which so constantly accompany these affections are prone to linger and predispose to pulmonary tuberculosis. Ordinary colds should on no account be neglected.

When the child reaches 5 or 6 years of age, judicious and careful attempts further to brace and harden the constitution should be systematically pursued. For this purpose free exercise in the open air, wisely devised gymnastic exercises not involving any severe exertion, and cold sponging, cold affusion, or very brief cold douches, should be daily employed. The sleeping-room should be well ventilated by means of open windows.

The removal of hypertrophied tonsils and "adenoids" when they exist is advisable, as they impede respiration and diminish chest expansion.

It is necessary to watch carefully the education and school-life of such children. Close application to study in crowded school-rooms must be positively forbidden; overtaxing the physical and mental powers must be carefully avoided, and all faulty attitudes and positions during school studies should be corrected.

There are certain periods of life which have been regarded as specially dangerous for those who inherit

a predisposition to phthisis. These are the periods of first and second dentition, of puberty and early adolescence, and between the ages of 20 and 30.

At the period of puberty we have to guard against the depressed nutrition so often associated with the exhausting influence of rapid growth. A life of wholesome activity in the open air, out-of-door exercises and occupations, a nutritious but unstimulating diet, as well as the provision of healthy food for the mind—these are wise and necessary precautionary measures at this period of life.

When the strength and nutritive power seem seriously impaired by rapid growth, it will be well for such patients to seek a sunny climate in winter, and tonic mountain- or sea-air in summer; in both cases in situations where an out-of-door life is possible.

In the choice of a school preference should be given to those in elevated situations near the seaside. Such places as Eastbourne, Seaford, Folkestone, Westgate, or Broadstairs, and many others fulfil all the essential requirements.

The extreme value of sea-air and sea-baths in combating the tendency to tubercular affections has been established by long experience, and for delicate children and young people presenting the signs of the tubercular diathesis, prolonged residence at the seaside and the regular use of sea-baths, cold in the summer, and, if necessary, warmed in the winter, are of the greatest benefit.

Sir Hermann Weber and others have warmly advocated the establishment of seaside sanatoria for the reception of poor children suffering from tubercular complaints.

The occurrence of progressive loss of flesh is often one of the first evidences of impending danger. But it would be incorrect to conclude, on that account, that all the subjects of progressive emaciation are on their way to become tuberculous.

The emaciation which is so frequently regarded as the precursor of pulmonary phthisis is probably, in

most instances, but the first manifestation of the actual presence of the disease; a vigilant prophylaxis then requires us to be on our guard, lest we allow a tendency to progressive emaciation in the young and delicate to proceed unnoticed. In such cases we should exercise a careful supervision of the diet, and see that it is sufficient in all respects, and that it includes an adequate proportion of fat and flesh-forming food in easily digestible forms. Much firmness often needs to be exercised with delicate and fanciful children to ensure their consumption of a sufficient quantity of suitable food.

Abundant gentle—not exhausting—exercise in the open air is beneficial to such persons, as horse, or carriage, or boat exercise.

(*c*) All such persons as we have been referring to should, while submitted to the bracing and invigorating influence of open air, be protected in every way from the causes of catarrhal, congestive, or inflammatory attacks of all kinds; from indiscreet exposure to changeable or inclement weather; and from the dangers of over-excitement and excesses of all kinds.

Suitable gymnastic exercises for the purpose of increasing the capacity of the thorax—generally small, flat, and narrow in such persons—of strengthening the respiratory muscles and those of the upper limbs, and so of promoting lung ventilation, are of undoubted value.

A period of a few weeks during summer, or longer if any troublesome catarrhal attacks have occurred, spent in some mountain district, from 4,000 to 6,000 feet above the sea-level, is valuable, not only for its general bracing effect, but for the pulmonary gymnastics which a residence in the rarefied air of these regions necessitates, and the more complete pulmonary ventilation thereby secured.

All occupations should be avoided which entail confinement in close, ill-ventilated apartments or workshops, as well as those which necessitate cramped attitudes and positions that interfere with proper

expansion of the chest and free aeration of the lungs; so also should all employments which involve exposure to irritating vapours or dusts, or other injurious influences, such as sudden and great changes of temperature, which may excite or maintain catarrhal conditions of the air-passages. The choice of out-of-door occupations and the avoidance of sedentary ones should be urged on all those who inherit a tendency to phthisis.

The close relationship between wetness of soil and the prevalence of phthisis should be constantly borne in mind, and those with a disposition to this disease should avoid such localities.*

(*d*) The important point of the prevention of the transmission or **communication** of this disease from the sick to the sound must next be considered.

Phthisis is spread by communication, *chiefly through the agency of the sputum*, which, when dried, is converted into dust, and may thus be carried into the atmosphere, or "by coughing, and even spitting, it is flung into the air in little drops, that is, in a moist condition, and can at once infect persons who happen to be near the cougher."† It has been pointed out that phthisical patients cough much more than they need do if they would only use a little self-control in this respect.

Disinfection or destruction of the **sputum** of phthisical patients is of prime importance in preventing the spread of tuberculosis. In most cases of phthisis the sputum contains tubercle bacilli, often in great numbers. The best means of disinfecting sputum containing these bacilli is to mix it in equal parts with a 2 per cent. solution of chlorinated lime.‡ Exposure to boiling water for half an hour,

* Dr. Gordon, of Exeter, has reported some very careful observations in support of his contention that populations exposed to strong prevalent rainy winds (S.W., W., and N.W.) have a greater death-rate from phthisis than populations sheltered from them.—*Brit. Med. Journ.*, Nov. 3, 1906.

† Brouardel, Address at British Congress on Tuberculosis.

‡ Some use a mixture of lysol and soap.

or to steam at a temperature of 212° F. for half an hour to an hour, is also effective. It is an advantage to add some bicarbonate of soda to the water.

The danger of re-infection cannot thus be obviated. "A patient on the road to recovery may be re-infected by his own sputum." If during expectoration some of the sputum should be accidentally aspirated into the sound lung or the sound parts of the affected lung, fresh centres of infection may be started. Some may also be swallowed and infect the intestinal canal. Great care must therefore be taken not to swallow sputum, and that all sputum expectorated be destroyed: antiseptic vapours, sprays, and mouth-washes—the two latter expressly for the purpose of ensuring the expectoration of the contents of cavities in contact with an antiseptic medium—may be of some service.

Linen, handkerchiefs, underclothing, sheets and pillow-cases, etc., which have incurred the risk of contamination with phthisical sputum may be disinfected by boiling water; blankets, mattresses, etc., by exposure to steam for an hour, or to a dry heat (as in a disinfecting stove) of 250° F. for several hours.

The risk of infection by the dust of dried sputum may be provided against, to some extent, by the following precautions: Phthisical patients must be warned not to spit on the floor, rugs, or carpets, nor in the streets, nor into handkerchiefs, unless Japanese paper ones which can be burnt immediately; but as some sensitive patients will scarcely be prevented from using handkerchiefs for this purpose, these should be plunged into boiling water as soon as they have been used. They should also be carried either in an indiarubber or oil-skin bag or in a pocket lined with a detachable lining of such material which can be regularly cleansed with boiling water. Phthisical patients must also be directed to cover the mouth with a handkerchief when coughing. Convenient spittoons should be provided for every

patient, containing a little 5 per cent. carbolic solution to disinfect and keep the sputum moist. These can be made of pasteboard, enclosed in a tin case,

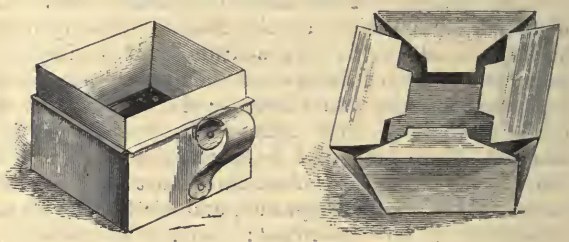

Fig. 18.—Sanitary Cuspidor.

so that they can be burnt after use, and the tin case scalded with boiling water. Fig. 18 shows the pattern of one commonly used in America, and termed the "Sanitary Cuspidor."

Dettweiler devised a convenient flask for carrying

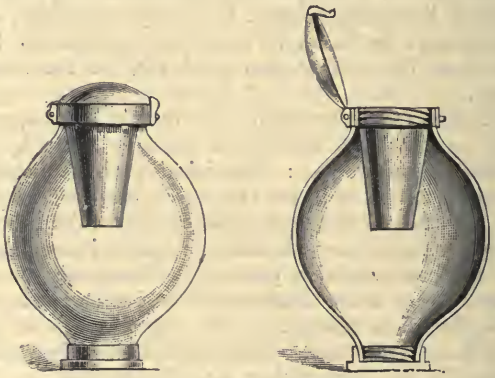

Fig. 19.—Dettweiler's pocket flask.

in the patient's pocket, so as to avoid the necessity of spitting into a handkerchief or in the street; it is shown in Fig. 19.

It is flat, made of blue glass, and holds about

three ounces. It will be seen that it has an opening at the top and bottom, provided with screw caps. To the upper opening is fitted a tightly-shutting spring cover or lid, and a polished metal funnel, which reaches half-way down into the flask. This funnel acts like that of certain ink-bottles, and prevents the spilling of the contents of the flask even if the cap is left open. The lower opening allows it to be thoroughly cleansed. It is partly filled with disinfecting fluid, its contents are frequently burnt, or discharged into the drains, and the vessel is cleansed with boiling water.

Spittoons should be kept covered, lest flies settling upon sputum should be the means of carrying infection. In clubs and public places spittoons should be filled with sawdust saturated with a solution of carbolic acid, and their contents frequently burnt.

It is best to provide the phthisical patient with separate knives, forks, spoons, and other table utensils, and to see that they are thoroughly cleansed after using.

As the hair, especially that of the beard, and the nails of phthisical patients may become soiled by sputum, the hair and beard should be worn short, and the hands, nails and beard frequently washed with disinfecting soap. Dust should be prevented from collecting or depositing itself in the rooms occupied by phthisical patients. The walls should be rubbed down with new bread, which is then burnt, and the furniture frequently wiped with a cloth damped by some antiseptic solution. The floor should be sprinkled before sweeping, and the sweepings burnt. Carpets and curtains are best dispensed with altogether. The rooms should be kept thoroughly ventilated by widely opened windows.

Close intimacy with the subjects of advanced phthisis should be avoided, and the bedroom of a phthisical patient should not be shared by anyone. Kissing on the lips should be forbidden. The rooms that have been occupied by phthisical patients must

be thoroughly cleansed, and, when practicable, repapered, painted, and whitewashed before they are lived in by others.

But inhalation of bacilli into the lungs is not the only means by which pulmonary tuberculosis is excited. Abundant evidence has accumulated to show that bacilli introduced into the alimentary system in the food may, and often do, find their way thence into the bronchial glands and lungs. Thus great care must be taken to prevent the **ingestion** of the tubercle bacillus in milk, meat, or other food susceptible of this contamination.

It is certainly desirable that information as to the manner in which this disease is propagated should be diffused widely amongst the public, and we heartily approve of the active propaganda of recent years directed to this end. The adoption of notification of pulmonary tuberculosis by the medical officer in attendance is an important advance in the campaign for stamping out the disease. Much more will depend upon the thoroughness with which the information gained by means of notification is acted upon, in the way of disinfection of the premises and adequate isolation of the infected.

CHAPTER XXX

REGIMINAL TREATMENT OF PHTHISIS, INCLUDING SANATORIUM TREATMENT

Importance of Regiminal Treatment—Food—In relation to the Fever—Relative Values of Proteins, Fats, and Carbohydrates—Care in the Preparation of Food—Milk and Cream—Koumiss—Farinaceous Foods—Alcohol—Alimentation forcée—Importance of Varied and Attractive Diet—Daily Dietary—Air and Ventilation—Rest—Induced Pneumothorax—Bodily Exercise—Hydrotherapy—Baths and Douches—Sponging—Clothing—Sanatorium Treatment.

We propose in this chapter to consider the regiminal treatment of phthisis, the supreme importance of which is now fully recognised. A disease which is so profoundly influenced by the state of nutrition of the body must be encountered by the most scrupulous regard of all those daily and hourly conditions and habits of life which tend to support and strengthen the constitution, and impart to it a resisting power.

A very great part of the undoubted advantage which phthisical patients gain from residence in sanatoria must be attributed to the constant detailed and intelligent supervision they receive in these institutions.

"*Im Kleinen grosse*"—"Great in small things"—was the motto chosen by Dettweiler, of Falkenstein; which means that every detail of the daily life of the phthisical patient, with regard to food, drink, exercise, clothing, sleeping, etc., should be regulated and fixed by medical authority.

First, as to the **food** of the phthisical patient.

In a disease like pulmonary consumption, usually attended with a chronic febrile condition and continuous loss of weight, unless this progressive wasting, which is an index of the resisting power, is

counterbalanced by the supply and annexation of an adequate amount of food, the patient must, in course of time, succumb to the disease. Tubercular patients with active disease require more food than persons in health, in order to compensate for the increased tissue waste. It is well known that if we are able to establish an improved state of nutrition the disease itself becomes favourably influenced thereby. Our success in this effort will depend much on the amount and type of the fever which accompanies the malady. When there are distinct intermissions or remissions in the fever, and when it is quite moderate, we may succeed in procuring the assimilation of a considerable quantity of food, provided care and discretion be employed in its selection and preparation. But when the fever is considerable and persistent, and the digestive functions (as is usually the case in such circumstances) are greatly impaired and appetite is entirely absent, it may be difficult or even impossible with many patients to obtain the appropriation of a sufficient quantity of food to exercise any adequate check on the wasting process. In such cases we are compelled to have recourse to fluid foods, or to such foods as the patients can digest readily, in much the same manner as in the dietetic management of acute febrile diseases.

It is a generally accepted rule that in the diet of the consumptive the proteid foodstuffs are of first importance, but fats and carbohydrates—i.e. the especially fattening forms of food—should be adequately represented as well.

Phthisical patients whose digestive functions are unimpaired may be allowed to partake of the various nourishing forms of food that enter into the ordinary dietary of the healthy, in addition to which two or three glasses of milk should be taken at convenient intervals between meals, also a glass of milk should be taken the last thing at night, and again during the night if the patient is wakeful.

One of the greatest difficulties we encounter in providing a suitable and adequate diet for consumptives is the frequency with which they complain of digestive troubles, want of appetite, and, occasionally, of positive disgust for food. In such circumstances it is most important to provide well-cooked, appetising, and attractively served food, varied as much as possible, and, so far as is consistent with wholesomeness, agreeable to the tastes of the patient.

In sanatoria and while living in the open air even febrile patients can be induced to consume solid food of the most substantial kind, and it has been pointed out that it is not difficult to induce the phthisical patient to take a large number of raw eggs daily—a very excellent and nourishing food. Custard and junket also afford valuable nourishment.

Cream may be made digestible and acceptable to many patients by mixing it with an equal quantity of hot water, and adding to each teacupful of the mixture half a teaspoonful of the aromatic spirits of ammonia, or, as some prefer, a teaspoonful of brandy. In other cases, if necessary, we may use whey, butter-milk, or peptonised milk.

Koumiss, or fermented mare's milk, has acquired a great reputation in Russia in the treatment of pulmonary tuberculosis, and the Russians resort in considerable numbers to those stations on the borders of the Caspian Sea, amongst the Kirghis and Tartar tribes, where the koumiss cure is carried on.

It is an appropriate beverage in febrile cases, as it quenches thirst, and can often be retained in the stomach when all other food is rejected; indeed, its special value is in those cases of inveterate dyspepsia and gastric irritability in which all attempts at giving other kinds of food have failed.

Powell and Hartley* give directions for making a *home-made koumiss*. Boil fresh milk and put it, when nearly cold, into quart champagne bottles, leaving space enough to make free shaking possible; add to

* "Diseases of the Lungs and Pleuræ" (5th edit.), p. 520.

each a teaspoonful of crushed lump-sugar, and a piece of German yeast, about the size of a hazel-nut, obtained *fresh* from any baker of Viennese or fancy bread; cork with clean new corks, tie down and wire; keep in a cool place, lying down, and shake twice daily. The koumiss will be ready for use on the sixth day—earlier in hot, later in cold weather. A thinner koumiss may be made from skimmed milk.

Professor Fuster, of Montpellier, and subsequently Messrs. Richet and Héricourt, recommended, under the title of *zomotherapy*, the use of raw meat and "muscle juice" in the feeding of phthisical patients; and Dr. Philip, of Edinburgh, also advocates raw meat, and considers it to have a therapeutic as well as a dietetic value. We cannot say that we have ourselves seen any brilliant results follow its use.

The different kinds of farinaceous foods are all useful and appropriate articles of diet. Wholemeal bread is, on account of the phosphates contained in it, better suited to young consumptives, if they digest it well, than fine white bread. Lentil flour also is valuable, as it contains notable proportions of phosphates and of iron. Oatmeal is rich in fatty matters, and the flour of maize is still richer—a fact which renders them both very suitable additions to the diet of the tuberculous.

With regard to the use of *alcoholic beverages*, much difference of opinion exists.

We shall find, practically, that the use and need of alcohol vary greatly in different individuals. In some it diminishes appetite and retards digestion; in others it promotes both; and we shall encounter very few cases of phthisis which are not benefited, at some period of their course, by the discreet administration of alcoholic stimulants.

It is exceedingly necessary that the beverage should be pure and of the best quality.

When the patient is able to drink fermented *malt* liquors, he may be allowed two or three glasses daily

of good, sound bitter beer, or porter, or stout; of wines, half a pint to a pint of really good Bordeaux or Burgundy, or of some of the better descriptions of Hungarian, Italian, or Greek wines.

In febrile cases small quantities of alcohol given frequently have an excellent effect in supporting the strength; and especially during the night is it important to give two or three tablespoonfuls of brandy or whisky, alone, or with a little fluid food, such as milk, or beef-tea, or a whipped egg.

What was termed by French physicians *alimentation forcée*—i.e. forced feeding—has, in the manner originally applied, fallen into disuse, but the principles involved are applied as a part of sanatorium treatment, and patients in such institutions are, as we shall see, urged to consume a considerable amount of food as a necessary means to their restoration to health. The end to be kept in mind is to bring the patient to a good average weight, and to maintain him at it, not to load him with superfluous fat, which is a useless additional burden for him to carry about.

While we should do all in our power to encourage our phthisical patients to take an abundance of nourishing food (and for this purpose we should make their diet as varied and attractive as possible), we must be careful not to admit into their dietary forms of food which, although attractive to the patient, tend to exhaust his digestive forces without rendering him an equivalent amount of support and nourishment. We should, therefore, exclude pastry, uncooked fruits, salads, pickles, and all forms of indigestible food.

It would be undesirable to fix too rigidly the daily dietary of the phthisical, but the following scheme may serve as a general guide—a sort of plan of route from which wide excursions may be made under the guidance of a discreet physician:

On waking in the morning, a tumblerful of milk should be taken mixed with a little hot water, to which it is often useful to add a few grains of common salt and bicarbonate of soda, which greatly promote

expectoration, especially when a certain amount of accumulated mucus has to be got rid of; or tea, coffee, or cocoa, with milk or cream, may be taken if preferred. Sometimes in advanced cases the stimulus of a tablespoonful of brandy, rum, or whisky in addition is needed at this time. This first meal is best taken in bed. About an hour afterwards a substantial breakfast should be taken, consisting either of broiled bacon and lightly-boiled eggs, or some fresh fish, or some cold meat or game or poultry, and with this meal milk, or cocoa, or coffee, or tea, or some good sound light wine and water may be taken, according to custom and taste.

Supposing this meal to be taken about nine or ten o'clock, a glass of milk should be taken about noon.

Half-past one or two o'clock is a good hour for the chief meal of the day. This should consist of some fish, when it can be procured fresh and good, together with some meat, chicken, or game, and potatoes and fresh vegetables; and some light milk-pudding with a little marmalade or other cooked fruit. With this meal half a pint of good Hungarian wine, light claret, or Burgundy may be taken.

At four or five in the afternoon another glass of milk should be taken, or a cup of chocolate, or tea with plenty of milk or cream; or a raw egg may be substituted. It is rarely desirable to order any solid food at this hour if it is intended that the patient should make another substantial meal at seven. At this hour a meal similar in all respects to that taken at half-past one or two o'clock should conclude the substantial feeding of the day.

About half an hour before bedtime (which should not be later than 10 or 10.30 p.m.) another glass of milk, prepared in the same manner as that in the morning, together with one or two tablespoonfuls of brandy or whisky, or a cup of arrowroot, or beef-tea, or tapioca soup, according to taste, may be taken. And, finally, some light nourishment mixed with a little stimulant should be provided to be taken during

the night, when the patient is wakened by coughing, or after perspiration, or when merely restless.

In distinctly febrile cases a much more fluid dietary will have to be followed, and the food will require to be taken at shorter intervals.

The following dietary is that in use at the King Edward VII. Sanatorium :—

DIET SHEET OF KING EDWARD VII. SANATORIUM

(*Prepared by* Dr. Noel Bardswell, *Medical Superintendent*)

A (*for Men*)	B (*for Women*)
BREAKFAST, 8.30 A.M.	
Porridge (cooked), ½ pint (with milk).	Porridge (cooked), ½ pint (with milk).
Bread, 2 oz.	Bread, 1½ oz.
Butter, ½ oz.	Butter, ½ oz.
Egg, 1.	Egg, 1.
Bacon or tongue or ham or brawn or fish, 1½–2 oz.	Bacon or tongue or ham or brawn or fish, 1–1½ oz.

Tea or coffee with milk, marmalade or jam.

LUNCHEON, 1.15 P.M.	
Milk, ½ pint.	Milk, ½ pint.
Bread, 2 oz.	Bread, 1½ oz.
Butter, ½ oz.	Butter, ½ oz.
Meat 3 oz.	Meat, 2½ oz.
Pudding (milk or suet), 5 oz.	Pudding (milk or suet), 5 oz.

Potatoes, other vegetables, cheese, salad, biscuits.

Tea, consisting of tea, bread-and-butter, and cake, is not compulsory, but, as a matter of experience, patients almost invariably take an average-size tea.

DINNER, 7.15 P.M.	
* Soup (vegetable), ½ pint, or fish, 2½ oz.	Soup (vegetable), ½ pint, or fish, 2 oz.
Meat, 3 oz.	Meat, 2½ oz.
Milk pudding, 5 oz.	Milk pudding, 5 oz.
Bread, 2 oz.	Bread, 1½ oz.
Butter, ½ oz.	Butter, ½ oz.

Potatoes, other vegetables, cheese, salad, biscuits

Coffee after dinner.

* Soup is given four days a week, fish two days a week.

Half a pint of milk is given either at 7.30 a.m. or at noon, and at 10 p.m., in addition to the above meals, thus making 3 pints of milk taken during the twenty-four hours, including ½ pint contained in milk puddings. Stewed fruit is given with the milk puddings at either lunch or dinner every day.

The exact amounts of the various foodstuffs are weighed out in the serving-room before being taken to the dining-hall.

The above dietary is modified in various ways for individual patients and for those confined to bed. For the latter, in place of the ordinary meal at luncheon and dinner, fish (boiled or fried), chicken, sweetbread, mince, etc., are given. Puddings also for these patients are more varied—junket, custard, jellies, etc., in lieu of the usual suet and milk puddings. Special dietaries are prescribed for those suffering from such complications as dysphagia, hæmoptysis, etc.

Air and ventilation.—It is exceedingly necessary to watch over the respiratory functions of the phthisical, and to see that they breathe a pure, untainted atmosphere. Wherever and whenever it is safe and possible to be altogether in the open air, there the sufferers from phthisis should be.

The advantage of a southern aspect for the sleeping apartment of the phthisical, in a situation sheltered from prevailing winds, is chiefly that the windows can be always open, and the apartment thus constantly kept filled with pure and fresh air, which the rays of the sun warm and vivify.

It is to the possibility which it often affords of being much in the open air, at all seasons of the year, that *change of climate* owes its great value.

Even in England it has been shown that in properly selected localities, and in well-organised sanatoria, it is possible for patients to be kept much in the open air all the year round.

In advanced cases, when the patient is, of necessity, much confined to his room, a comfortable reclining couch should be provided, so that even if very feeble or feverish he need not be confined too closely to his bed. The bed should be free from all hangings, and if the windows are kept open, as is desirable, the patient should be very warmly clothed or covered, so as not to feel cold. The temperature of

the room should range between 60° and 65° F., according to the feelings and condition of the patient. In very cold weather, when the temperature of a room quickly falls, and is often with difficulty renewed, the maintenance of a temperature of 65° will not be found too great for advanced cases. An open fireplace is the most cheerful source of heat, and it also promotes ventilation.

However important and suitable to the majority of cases open-air treatment may be, we must by no means disregard the need of shelter from cold for certain highly sensitive and catarrhal patients; indeed, discretion and discrimination in this respect are as important as in the question of food.

The rational control of **rest** and **exercise** is one of the most important considerations in treatment. Marcus Patterson* says: "Rest is the control, which is devised to check excessive auto-inoculation, when the response is weak, and exercise the artificial stimulant of auto-inoculation, when the response is likely to be adequate."

Rest in bed during the febrile periods, in which auto-inoculation is excessive, is essential; the temperature chart is then the best guide to the stringency of its application. In the severest cases motionless recumbency may be called for at times. We have in the discriminating use of rest a valuable means of controlling fever and regulating the amount of toxin absorbed from the tubercular focus into the general circulation. Even in the absence of fever, rest may be required for relief of urgent dyspnœa, or to steady a quick, thready pulse, which is often met with in phthisical patients.

The renewal of exercise, after such enforced periods of rest, must always be cautious and gradual, and attained by progressively diminishing the period of enforced rest. *Massage* will sometimes be desirable for patients confined to bed.

So long ago as 1892 Fortanini attempted to apply

* *Practitioner*, Jan., 1913.

the principle of complete rest to a tuberculous lung by the *induction of artificial pneumothorax.* The method has found strong support in this country from Drs. Claude Lillingston,* S. V. Pearson,† and others.‡ The indications for this somewhat heroic measure would seem to be progressive increase of the local disease in one lung in spite of all other measures of treatment, and the limitation of excessive auto-inoculation; sometimes also it has led to the arrest of persistent and exhausting hæmoptysis. A prime condition of the procedure is comparative freedom from disease of the opposite lung; and it is, of course, essential that the diseased lung should not be extensively bound to the chest-wall by widespread pleural adhesions. Lillingston attributes the good effects of this treatment (i) to limitation of auto-inoculation by immobilisation of the lung; (ii) to compression of tubercular foci, and expression of the contents of cavities; (iii) to the resultant fibrosis encapsuling diseased areas. Fortanini's method of introducing warm nitrogen gas into the pleural sac through a hollow needle connected with a manometer is the safest form of procedure. It is important to introduce small quantities of gas at a time and to introduce it slowly: at the first injection some 300 c.c. is sufficient, and a somewhat greater quantity can be injected on successive days, till complete collapse of the lung is obtained. The dangers of the operation, which have caused death on several occasions, are (i) *gaseous embolism,* which should never occur if the oscillations of the manometer are watched, indicating that the point of the needle is in the pleural cavity; (ii) *pleural reflex shock:* this is best avoided by injecting 5 c c. of 2 per cent. novocaine into the intercostal tissues right up to the parietal pleura by means of a hypodermic needle, prior to the introduction of the hollow gas-needle; (iii) pro-

* *Lancet,* Dec. 14, 1912, and *Practitioner,* Jan., 1913.
† *Brit. Med. Journ.,* Oct. 12, 1912.
‡ *Edin. Med. Journ.,* July, 1912.

duction of *natural pneumothorax* by laceration of an adhesion : nothing can forestall this complication but admission of small quantities of gas at a time and under low pressure.

After complete initial collapse has been obtained, fresh injections will require to be administered at intervals, at first of days, later of weeks, as the physical signs indicate, and the collapse may be maintained for several months if needed. In one-third of the cases pleural effusion supervenes upon the induced pneumothorax, and has to be periodically withdrawn by aspiration, until it undergoes spontaneous arrest. The results of the operation undoubtedly justify its employment in a small proportion of cases, but the necessary attention to technical detail is such that we feel it should only be undertaken by a competent and experienced surgical practitioner.

Graduated bodily exercise is of all things most essential in the treatment of chronic and *afebrile* forms of phthisis, as without it nutrition languishes and the bodily strength steadily diminishes. The thermometer is again of the greatest value in determining the amount of exercise that is desirable in each individual person. Some rise of temperature is almost inevitable : the important point is its ready subsidence on resting.

Sydenham maintained that daily and continuous horse exercise was the best treatment for consumption.

Regular walking and riding exercise (always stopping short of fatigue), and slow, regulated climbing, bringing into play a certain amount of lung gymnastic, are most useful in promoting nutrition, limiting the spread of local disease, and favouring regressive and curative processes, by promoting complete expansion of the sound portions of lung, and thorough pulmonary ventilation, and more perfect oxygenation of the blood. Consumptive patients should be taught, in their outdoor exercise, to practise, from time to time, taking the deepest possible inspiration,

followed by the completest possible expiration ; and by this lung ventilation carried out with gentleness, and without any undue effort, they should be given to understand that they make the best possible use of their opportunities of breathing pure, healing air. The morning hours are best suited for the chief exercise of the day. Exercise is an important agent in improving appetite.

When walking or riding is too fatiguing, carriage exercise, or exercise in a bath-chair, or in a rowing- or sailing-boat, on sea or river, is admissible in fine weather. Gardening affords an admirable way of combining exercise with life in the open air. With intelligent supervision it is susceptible of the most delicate graduation. The moral effect of being engaged in *useful* work is not to be underrated. Dr. Paterson has elaborated, at the Frimley Sanatorium, a system of graduated labour which has been attended with the happiest results.

We have spoken in the chapter on prophylaxis of the great importance of a *bracing, tonic treatment of the skin*, which is abnormally sensitive and impressionable in some phthisical subjects ; a treatment that is intended to diminish the tendency to chills, which often react unfavourably on the lung condition. With this object in view some physicians who have had the special care of patients with phthisis have been led to employ and advocate a modified **hydrotherapeutic course** in the management of the more chronic forms, and this is included in the healing resources of many sanatoria.

It is scarcely necessary to say that the application of the cold douche in such cases requires the greatest caution and circumspection. Sokolowski studied the effect of the cold-water treatment on 105 patients with phthisis, at Göbersdorf, and he reported that out of these there were thirty-nine complete cures, thirty-four greatly benefited, nineteen slightly benefited, seven derived no benefit, two were made worse, and four died. He points out the necessity of great

prudence in its application, and that it is only suited to those cases in which the local lesions are not extensive; that it is counter-indicated in cases of profound anæmia, in hectic fever, and in all cases which are not at once benefited by the first few douches. The douches should be of very short duration, commencing with four to five seconds, and increasing to thirty seconds with females, and fifty seconds with males. At Davos the application of cold douches of short duration to the chest has entered largely into the practice of some of the physicians there.

No doubt these cold douches of short duration have an excellent general invigorating effect on those who can support them, and who react vigorously to them, especially when they are commenced during the hot season; and they undoubtedly tend to strengthen the skin, and to remove that tendency to take cold from the slightest exposure which is so troublesome in the phthisical. But those, even, who are quite unable to support the cold douche may derive much benefit from cold or tepid general sponging of the skin in their own apartments, and it is often an advantage to add a little alcohol, or eau-de-Cologne, or toilet vinegar, to the water used. Only a portion of the body should be uncovered and sponged at a time. But often the whole body may with advantage, once a day, be rapidly sponged over with cold water, provided this is done in a *warm* room. If, for the sake of ventilation and freshness, the patient's bedroom is not kept very warm, he should pass into a *quite warm* dressing-room before the cold sponging is applied. It is the combined contact of *cold air* and cold water that causes the latter to be ill borne.

After the application of cold or tepid sponging the surface of the body should be well rubbed with a warm, dry towel.

The **clothing** of phthisical patients should be light, but warm; light woollen material is the best.

As they are usually very sensitive to cold currents of air and to changes of temperature, they should always have an extra wrap or warm covering at hand to put on when feeling the least chilly. It is a mistake to wrap up the chest, as so many do, with layer after layer of flannel, cotton-wool, rabbit skins, "chest protectors," porous plasters, etc. When such a patient removes all these coverings you will often find the surface of the body wet with confined perspiration, in which the skin is, as it were, soaked, and rendered thereby much more sensitive.

All the clothing should be changed at night, and a thin flannel or woollen nightgown put on; too much clothes must not be heaped on the bed, especially when there is a tendency to night-sweats; and when the bedroom is kept at a suitable and equable temperature a great quantity of bed coverings is not needed, but when the room is freely exposed to the open air, winter and summer, it is highly important that the patient should have a sufficiency of warm coverings that he may not feel cold.

Sanatorium Treatment

In the management and treatment of cases of pulmonary tuberculosis sanatorium treatment has in recent years taken, and justly so, a very prominent place. One very important result of the popularity of this mode of treatment has been that cases have been brought *under constant medical supervision* and a strictly hygienic mode of life at a much earlier stage of the disease than used formerly to be the case. It is now usual, as soon as the earliest signs of phthisis are observed, to send the patient at once into a sanatorium, where he is seriously taken in hand by *experts* and placed under the best conditions for antagonising the disease. This fact alone—the early stage at which the disease is seriously and systematically attacked—is sufficient to account for a very great portion of the success which has followed the adoption of this mode of treatment. No doubt, as

Sir R. W. Philip* has said, "the public have been led to expect too much from sanatorium régime," especially in advanced cases, and are asking, "Are sanatoriums worth while?" But it should be borne in mind that the success of sanatorium treatment depends on several factors beyond the control of the superintendent. The patient sent to him must be suitable for treatment, must stay a sufficient length of time, and must submit to an adequate after-care on leaving the sanatorium.

"The essential of the present-day sanatorium idea," says Philip, "is the free exposure of the patient to the open air. He must be bathed in fresh, pure air day and night, and this irrespective of the goodness and badness of the weather, as popularly understood. The more sunshine, or at least sunlight, the better for the patient. The two conditions that the tubercle bacillus cannot withstand are fresh air and sunlight." There should be the freest access of pure, fresh air to the patient's apartment day and night. Sanatorium treatment has an important *educational and disciplinary* influence, for it teaches patients how to treat themselves and to avoid those pitfalls and indiscretions into which the consumptive patient is so prone to fall, and with such serious consequences.

In a sanatorium every resource of treatment should be, and usually is, at hand, and at a much *cheaper* rate than is possible in the patient's home. No matter how constant and scrupulous may be the attention of a private practitioner, the management of a febrile case cannot possibly be effectively carried out.

The advantage of sanatorium treatment is not limited to the opportunity it affords of hyperaeration of the lungs by being almost always in the open air, but depends also on the constant detailed supervision of the patient's life, in every minute particular, which is ensured. He is told when he needs rest, and when he can take exercise—when and how he should feed

* *Brit. Med. Journ.*, Dec. 1, 1906.

—how long he should sleep—how he should clothe himself—when to keep silence (a most important matter in laryngeal tuberculosis), and when to seek social intercourse. Every detail of his life is arranged for him to his advantage. It is desirable that fairly extensive private grounds should be provided for exercise and games and social intercourse. A sanatorium placed in a carefully selected locality and situation is more likely to be suitably situated than the majority of patients' homes. Open shelters in the grounds should be numerous in which patients can remain nearly all day long, and many may be so occupied by night.

In many sanatoria suitable occupations are found for non-febrile cases, and thus the reproach of fostering idle habits is avoided. Many of these cases may be suitably treated at their own homes.

When it is practicable, a combination of climatic and sanatorium treatment is preferable to sanatorium treatment without climatic advantages. But recent experience has shown that very good results can be obtained in well-planned sanatoria in carefully selected localities in England and Germany, whose climate, taken alone, could not be regarded as especially favourable to phthisical patients.

It must not be concluded that we think all phthisical patients should be removed from their homes and sent into sanatoria. We have already intimated that advanced and incurable cases are unsuited. Such patients, when members of poor families, should be received into sick-asylums where they can no longer be a danger to others. Certain persons of highly nervous temperament, who have passed beyond the earliest stages of the disease, are apt to be restless and excitable under too strict a discipline and alarmed and worried by the frequent use of the thermometer and other details. Such patients are best left in their homes or sent with a good nurse to a suitable climate.

It must also be admitted that there are patients

who do not benefit, but the contrary, by a full diet, and others, especially the catarrhal and those hypersensitive to cold, who are made very miserable by constant exposure to cold air. Again, active muscular men afebrile and with limited, non-progressive disease may be better and happier in a suitable mountain resort with interesting surroundings. Such patients object, reasonably enough, to the monotony of sanatorium life.

As we have already pointed out, a short period passed in a well-ordered sanatorium, at a suitable season, affords a valuable educational training in most cases; but for some slight afebrile cases, whose homes are in agreeable and bracing localities, with all the appliances available that are to be found in a sanatorium—good nurses, expert physicians to exercise constant supervision, discreet friends, pleasure grounds for exercise, and suitable apartments for an open-air cure—removal to a sanatorium is not absolutely necessary.

CHAPTER XXXI

CLIMATIC TREATMENT IN PHTHISIS

Difficulty in Selection of Climates—Cases unsuited to this Treatment—Qualities required in a Suitable Climate—Purity of Air the Chief—Objects sought in Change of Climate—Division of Climates—Examples of each Division—Value of Change of Climate as a Prophylactic—Marine Stations—Sea-voyages—Mountain Stations—State of the Lungs, etc., as Indications for Selection of Climate—Disease limited and localised—South African Resorts—The Long Sea-voyage—Climate of Altitudes and the "Alpine Cure"—Its Characters and Effects—Cases Suitable—Need for Discrimination in Selection of Cases—Intermediate Stations—Cases with more Advanced and Serious Lesions, and Chronic Cases—Egypt—Pau—Amélie—Division of Marine Climates into Sedative, Stimulating, and Intermediate—Characters of each, and Cases suitable to them—Examples.

Although, as we have already indicated, the prime essential of any climate is the supply of abundant pure and uncontaminated air, the important part which **diversity of climate** plays in the treatment and progress of cases of phthisis is universally admitted. The application, however, of suitable climatic treatment to individual cases is often a question of some difficulty.

The choice of a particular climate for a particular case will frequently have to be determined by individual and personal rather than by general and pathological considerations.

When we reflect that cases of consumption are arrested in their course, and apparently cured, in such a climate, for instance, as that of Arcachon, on the coast of the Atlantic, and also in such an apparently utterly different climate as that of Davos, we are led to the conclusion that we must seek for some special relation between the individual to be cured and the particular climate that will suit him. And it is

sometimes only by actual trial that such relation can be discovered.

Even in the application of knowledge derived from actual experience of certain climates we are often greatly disappointed, and the soundness of our judgment may in consequence be called in question by the embarrassing capriciousness of weather and the great variations of climatic conditions, in the same places, in different or successive seasons.

In the views, therefore, which we take of the influence and applicability of various climates in the treatment of different cases of phthisis, we should set ourselves free from the trammels of any narrow classification.

In connection with the recommendation of change of climate, the physician is often blamed for advising, or rather permitting, patients in advanced stages of phthisis to travel long distances, and to leave the comforts of home, when there is no reasonable hope of any decided benefit being thus obtained. No doubt the exercise of much judgment and discretion is needed in such circumstances, and while we should be especially careful not to impose useless fatigue and discomfort on our patients, and unnecessary expense and trouble on their friends, yet we must not forget that it is our duty to do what we can to render such life as is left to our patients as cheerful and bright as possible. The sadness and misery of the last few months of life are often greatly mitigated by removal from habitual surroundings which have become distasteful and wearisome, or from dull, cheerless city dwellings, to the contemplation of a landscape which presents all that is bright and beautiful in Nature.

It is, of course, almost unnecessary to say that cases of *acute phthisis* are not amenable to treatment by climate. Cases of rapidly progressing disease, especially with diffused infiltration on both sides, and considerable fever, are also to be excluded. All cases during attacks of hæmorrhage, of intercurrent

pneumonia, bronchitis, or pleurisy, with notable rise of temperature, should be kept at or near home, and the need of **complete physical rest** in all cases with a daily rise of temperature of one or two degrees or more should be borne in mind. Cases presenting unmistakable evidence of progressive intestinal ulceration should not be permitted to travel.

With these exceptions most cases of chronic phthisis may be more or less benefited during some considerable part of their course by climatic treatment.

With regard to the selection of a particular climate, and the conditions to be looked for in it, the absolute or relative purity of the air is, without doubt, the condition of chief importance. Compared with this, questions of small differences of temperature or of humidity are of far less concern.

It must have occurred to every practical physician of some experience to see patients the subjects of chronic, stationary phthisis, with a good deal of bodily strength and activity, who for a long series of years will go from one health resort to another, differing materially in climatic characters, and will enjoy fairly good health in all.

We should learn from observations like these that we may allow some of our phthisical patients a great range of choice in the selection of a climate, provided it complies with the essential conditions of purity and asepticity of atmosphere.

We know that the air over the open sea, and the air in elevated regions, are alike in their freedom from the presence of organic impurities, and that although these climates may seem to be, in a certain sense, opposed to one another, yet that, in some important respects, they are similar.

If, now, we ask ourselves what it is we desire to effect when we make use of change of climate in the treatment of phthisis, we may hope to get a clear view of the problem before us.

In the *first* place we utilise change of climate as a *means of prevention* in cases in which we have

reason to apprehend a tendency to this disease. We thus strengthen the resisting power of the patient.

Secondly, in cases where the local mischief is limited and quiescent, and the constitutional condition is good, we look for a climate which will promote regressive, curative changes, by increasing the patient's strength and his power of resistance to the tubercle bacillus.

Thirdly, in cases where the disease is more advanced, and the general health more gravely compromised, we desire to find a climate which shall contribute, if not to the retrogression, at any rate to the arrest of the disease, and to the restoration in some degree of the constitutional tone and vigour.

Fourthly, in still more advanced cases, where we have ceased to hope for any great general or local improvement, we desire to find a suitable place of residence favourable to the maintenance, if possible, of the *status quo*, and where the last years of the patient's life may be made as pleasant and comfortable to him as circumstances will permit.

Fifthly, we desire to find, in all these circumstances, comfortable, well-built, well-situated residences under the best hygienic conditions, with abundance of pure air and sunshine, a dry soil, the means of obtaining a generous, nutritious, and varied dietary, and last, but by no means least, suitable medical supervision.

Let us next inquire what are the resources in the way of climate we have at our disposal for the purpose of meeting the foregoing requirements.

For our present purpose the first and simplest division of climatic stations will be into—

A. Climates of Altitudes.—Mountain stations; these being usually several thousand feet above the sea.
B. Climates of the Plains.—Stations on or about the sea-level.

These two main divisions may be again subdivided into—

A. (*a*) *Alpine climates.*—Mountain stations more than 4,000 ft. above the sea.
(*b*) *Sub-Alpine or "intermediate" climates.*—Stations ranging usually from 1,000 to 3,500 ft. above the sea.

B. { (*a*) *Inland climates.*—Stations in the interior of continents.
(*b*) *Marine climates.*—Stations on the sea-coast, insular stations, and sea-voyages.

We will now enumerate examples of all these, so that we may have the question before us in a concrete form.

A. Climates of Altitudes.

(*a*) *Alpine climates.*—The stations of the *Upper Engadine: Samaden* (5,580 ft.), *St. Moritz* (6,032 ft.), *Pontresina* (5,960 ft.), *Campfer* (5,950 ft.), *Maloja* (5,880 ft.), etc.; *Davos Platz* (5,352 ft.); *Clavadel*, only 2 miles from Davos, of which it may be regarded as a part; *Arosa* (6,100 ft.); *Leysin* sanatoria, near Aigle (4,700 ft.). Leysin has now an English sanatorium, with an English physician. It is much less devoted to "sports" than Davos, and on that account better suited to many.

These are some of the chief Alpine stations *in Europe* which are, at present, available for invalids in winter as well as in summer.

Of other examples, out of Europe, the following may be mentioned :—

Jauja and *Huancayo* (8,000 to 10,000 ft.), in the Peruvian Andes; *Santa Fé de Bogota* (10,000 ft.), the capital of the United States of Colombia; *Quito* (10,000 ft.), in Ecuador; *Cuzco* (11,250 ft.), in Peru; *La Paz* (12,000 ft.), Bolivia; *Mexico* (6,000 to 8,000 ft.); *Puebla* (7,215 ft.).

In the United States of America there are *Denver* (5,200 ft.), *Colorado Springs* (6,023 ft.), in the Rocky Mountains of Colorado, and other less well-known resorts.

In South Africa, *Bloemfontein* (4,700 ft.), and the adjacent stations in the Orange Free State, are the chief representatives of these Alpine climates.

(*b*) *Sub-Alpine or "intermediate" climates.*—There are but few European examples of this division available or suitable for winter as well as summer residence of consumptives. The chief are: *Grindelwald* (3,468 ft.), *Beatenberg* (3,700 ft.); *Mont de Caux* (about 3,700 ft.), *Les Avants* (3,212 ft.), *Glion* (2,400 ft.), and *Montreux* (comprising several villages of from 1,250 to 1,500 ft.), all four adjacent, on or near the Lake of Geneva; *Aussee* (2,145 ft.), in Styria; *Le Vernet* (nearly 2,000 ft.), in the Pyrénées Orientales; *Göbersdorf* (1,700 ft.), in Silesia, the well-known

sanatorium, formerly under the supervision of the late Dr. Brehmer; *Falkenstein* (1,700 ft., about), in the Taunus Mountains, near Frankfort, also a sanatorium, like that of Göbersdorf; *Nordrach*, in the Black Forest (1,400 ft.); *Meran* and *Untermais* (1,050 ft.), and *Obermais* (1,200 ft.), all three adjacent, in the Southern Tyrol.

To the above European resorts may be added the station of *Hammam R'irha* (2,000 ft.), in Algeria, and several resorts in South Africa (in Cape Colony and in the Orange Free State).

B. Climates of the Plains.

(*a*) *Inland climates.*—There are very few inland resorts (apart from those in mountain districts) that have been thought suitable for the residence of phthisical patients. The valley of the Nile, in *Egypt; Pau; Amélie-les-Bains*, in the Eastern Pyrenees; and *Biskra*, in Algeria, may be mentioned.

(*b*) *Marine climates.*—Under this subdivision we have an immense variety of stations to choose from, which themselves need classification, according to their temperature and its periodical oscillations, their humidity, their protection or exposure to winds, etc.

On the English coast we have *St. Leonards*, *Ventnor*, *Bournemouth*, *Sidmouth*, *Torquay*, *Penzance*, *Falmouth*, *Tenby*, and others; in the South of France, *Arcachon* on the Atlantic coast, and the various resorts on the Western Riviera, together with the adjacent towns on the Italian Riviera; the many resorts in the islands of the Mediterranean: *Ajaccio* in Corsica, *Palermo*, *Catania*, *Taormina*, and *Acireale* in Sicily; Corfu, Capri, Malta; *Malaga* on the east, and *Huelva* on the west coast of Spain; *Algiers*, *Tangier*, *Mogador*, in North Africa; the island of Madeira; Grand Canary and Teneriffe in the Canary Islands; Southern California in the United States.

From these and others, as well as the resource of a *sea-voyage*, we have a wide choice.

These few preliminary considerations place the problem of the climatic treatment of phthisis fairly before us, and we may now pass on to consider in detail the various questions which arise in their application to individual cases.

The most valuable means at our disposal for **preventing** the development of phthisis in individuals in whom the predisposition to this disease exists, either

from inheritance or from previous catarrhal or other pulmonary attacks, or where the strength and resisting power of the constitution have been gravely compromised by severe attacks of acute disease, are those associated with change of climate.

In all such cases there is one essential and predominating condition to be fulfilled, as we have seen in the preceding chapter, and that is the selection of a climate in which an **out-of-door life** in fresh, pure air can be largely followed.

When we have to deal with this predisposition in scrofulous children and young people we should especially recommend a life on the sea-coast, and when there is also a tendency to attacks of bronchial catarrh or pulmonary congestion we should recommend, *in winter*, the choice of a *southern* marine station, when practicable. An abundance of sunshine and sea-air is most serviceable in such cases.

A wide range of choice may be permitted. On the Riviera, Hyères, Cannes, Bordighera, and San Remo are, perhaps, the best stations for such cases; for excitable, nervous constitutions, Arcachon, Biarritz, and St. Jean de Luz are better. With regard to Biarritz, it must, however, be remembered that there is often a great deal of rain as well as severe winds to be encountered there in the winter, and it is not, therefore, at all well suited to cases in which catarrhal or other lung affection actually exists.

When, for other reasons, it may be more convenient, there is no objection in these cases to such winter stations as Gibraltar, Malta, Ajaccio, or Madeira.

On our own coasts, Falmouth, Penzance, Bournemouth, Torquay, Ventnor, Tenby, St. Leonards, etc., are suitable resorts. Glengariff, on the south-west coast of Ireland, is also well suited to such cases. For young and fairly vigorous male adults, who are fond of the sea, one or two long sea-voyages may be recommended.

Mountain stations, such as Davos and the Engadine, are especially suitable to cases or constitutions where

it is desirable to remove an undue impressionability of the skin and mucous membrane, or where attacks of pleurisy or pleuro-pneumonia have been imperfectly recovered from, or where pleuritic adhesions hinder the complete expansion of portions of lung; the lung gymnastics which residence in these altitudes enforces are exceedingly useful in removing such conditions.

Young, vigorous adults belonging to this category may also be allowed to undertake an active out-of-door life in the various resorts in the elevated inland districts of Cape Colony, and especially the Orange Free State in South Africa, or in suitable parts of Australia and New Zealand.

As we have already said, a very wide range of choice, according to individual tastes, requirements, or peculiarities, may be permitted to the cases that fall under this head.

We have next to consider the cases in which local mischief actually exists, but is **limited** in extent and at an **early stage.** In such cases of phthisis there are two chief objects to consider: first, the precise extent of diffusion of the more or less active specific infective agent; and, secondly, the various modes of reacting to its inroads presented by the different constitutions it invades.

We may recognise, in this way, two extreme types. There is, at one extreme, the constitution which succumbs immediately, and offers no kind of resistance to the infective invading organism, and through whose tissues it spreads with amazing rapidity; these form the cases of so-called "acute phthisis," or "acute pulmonary tuberculosis."

At the other extreme we find constitutions which strongly resist the invasion of the infective organism, constitutions whose tissues appear to oppose its inroads, and lend themselves unwillingly to its diffusion. These are cases of very slowly advancing chronic phthisis; *chronic*, if one may say so, from its commencement.

Between these two extremes we encounter very various degrees of acuteness and chronicity, corresponding with the various degrees and modes of reaction of the constitution, or of the tissues invaded, to the invading parasite. There may also be varying degrees, within wide limits, of amount and virulence of the invading bacillus.

There are three easily ascertainable conditions which afford us a sufficient guide for the practical purpose of determining questions of climate. These are :

1. The local extent of disease, as ascertained by physical signs.

2. The rate of progress of the local disease and the mode of reaction of the constitution, as indicated by the amount of fever.

3. The presence of other pre-existing and co-existing morbid states or tendencies.

In considering the best kind of climate for those persons with a small, limited, local area of disease, little or no fever, good appetite and digestion, and plenty of physical vigour, and no complications, we must take into account other circumstances affecting the individual—such as age, sex, occupation, position in life, and personal tastes and peculiarities.

Young males accustomed to and fond of an active agricultural life, and not averse from a little "roughing it," may be recommended to one or other of the many stations in the elevated plains of South Africa—in Cape Colony, the Orange Free State, or the Transvaal—where they will encounter a climate well adapted to this kind of life, one that has brought complete restoration of health to many.

The environs of Cape Town, such as Wynberg and Kalk Bay, are especially suitable for summer residence (October to March), when the air is dry and pure, and the heat moderate. The invalid must not stay there during the winter, when there is much rain and a moist atmosphere, with frequent mist and fogs. Of inland resorts, Ceres is one of the most accessible; it

is 1,700 feet above the sea-level, and only 84 miles by rail from Cape Town. At a short distance from this village is an elevated plateau 2,700 feet above the sea, with a fine, dry winter climate. Its climate in winter is not, however, so good as that of some of the higher and more distant stations, but it serves as a good intermediate station for those arriving from Europe. One of the best of the higher resorts is the Cradock district, 3,000 feet above the sea, on the main line of rail between Kimberley and Port Elizabeth, and about 180 miles from the latter. Middleburg (4,200 feet) and Aliwal North (4,350 feet) have also been recommended; so have Matjesfontein (2,970 feet) and Beaufort West (2,850 feet).

In the Orange Free State, which is an elevated plateau from 4,000 to 5,000 feet above the sea, with a remarkably dry climate, there are several resorts well suited for such cases as those we are considering. Bloemfontein (4,518 feet), its capital, and Bishop, which is more accessible, are both suitable places of residence, and the latter is said to have "rarely a single wet day in the year." Estcourt (3,833 feet), in Natal, has been highly spoken of as a resort for pulmonary invalids.

These are all excellent resorts for cases of early phthisis in persons of otherwise good health, possessing abundant capability of taking active exercise and following an out-of-door country life, and seeking occupation. The disease should be limited, non-progressive, and quiescent, or but very slowly advancing, and with little or no fever; in many such cases a complete restoration to health and activity may be looked for, so long as the invalid remains in such a climate. But South Africa should not be recommended to delicate persons who are dependent on luxuries and comforts, and quite incapable of "roughing it."

One or two long sea-voyages, or a sea-voyage to Australia or New Zealand, followed by an out-of-door life in suitable parts of the interior of these colonies,

may be recommended to the same class of cases. We have not seen much advantage, but often great disappointment, follow the recommendation of sea-voyages in more advanced cases, and in our own practice we never advise a long sea-voyage except to vigorous young males, who like the sea, and have only a small extent of local disease.

In a long sea-voyage to the antipodes there are obviously many possible circumstances which, if encountered, may prove injurious to invalids.

The resource of a sea-voyage should, therefore, be reserved for the young and hardy patient who may be suspected of a phthisical tendency, or who may have some slight apical mischief on one side, with little or no general constitutional disturbance. It is especially appropriate to those who are fond of the sea, and to those who may have opportunities of settling advantageously in the distant colonies of Great Britain. But serious hardships and disasters have frequently been the result of the indiscriminate prescription of a sea-voyage.

The **climate of altitudes,** the "Alpine cure," is well adapted to the same class of cases, in somewhat altered circumstances, as the long sea-voyage; but it is also adapted to a much larger group of cases, to many cases in which it would be out of the question to recommend a sea-voyage.

Immunity from consumption does not follow any particular level of elevation, and the mere amount of elevation is not so essential as has been supposed. The altitude of immunity varies in different latitudes. In the tropics it is necessary to ascend to an elevation of between 8,500 and 9,000 feet. In the Higher Pyrenees we are assured that at elevations varying from 1,760 feet (Bagnères de Bigorre) to 4,580 feet (Gavarnie), phthisis is equally rare. In Switzerland, some localities not more than 3,000 feet above the sea appear as free from phthisis as others of twice that elevation; and Dr. Brehmer asserted that in the neighbourhood of Göbersdorf, in Silesia (1,700 feet),

he had never seen phthisis amongst the inhabitants; from which it would seem that the freedom which any particular locality may appear to enjoy from this disease is independent of its mere elevation, and due in part to other conditions. One of these conditions is undoubtedly entire physical purity of the respired air, the absence of microbes and other septic contamination. The localities which enjoy immunity from phthisis are usually characterised by the possession of a pure, dry, aseptic atmosphere, a dry subsoil, and a scanty population.

But in a truly Alpine climate, at an elevation of 5,000 feet or over, as that of Davos or the Upper Engadine, other conditions come into operation.

Besides being pure, dry, and aseptic, the air is rarefied, cold, and antiseptic. It is also peculiarly still in winter (or rather, we should say, in a *good* winter), and free from local currents, and the sunlight and heat, owing to the perfect clearness and transparency of the atmosphere, are intense.

We may summarise the physical agencies to which the invalid is submitted in these elevated regions as follows:—

1. Extreme purity of air and freedom from floating particles, especially of organic germs.

2. Great dryness of the air and of the soil, and therefore an unusual freedom in winter from mist and fog.

3. Low barometric pressure and corresponding rarefaction of air.

4. Low temperature of the air (great cold in the shade), with great solar radiation or sun-warmth, which warms absorbent bodies exposed to its rays without much heating the air itself.

5. Great intensity of light during the hours of sunshine.

6. Remarkable stillness of the air in winter. (There is much more motion of the air, especially from local currents, in summer.)

7. An increased amount of ozone.

Many theoretical views have been advanced with the view of accounting for the action of the cold, rarefied air of these elevations on the human body; none of these has been altogether satisfactory, and we shall, therefore, confine ourselves in this place to noticing the effects observed to be produced in suitable subjects. These have been:

1. Increase of appetite, and improvement in the general nutrition and blood-making processes.

2. Increased tone of the heart and circulation.

3. A general increase of muscular capacity and nervous energy.

4. Increased ventilation of the lungs, owing to quickening and deepening of the inspirations, and the large quantity of pure, fresh air thus passed through them.

The amount of cold, dry air inhaled tends to a loss of heat, and so to diminution of fever, while the dryness of the air causes a considerable loss of water from the pulmonary surface, which, besides promoting the circulation through the lungs, tends to diminish secretion, so that moist catarrhal sounds disappear and expectoration is diminished.

It has been said that in the process of amelioration and cure the diseased parts of the lung become compressed by "emphysematous" dilatation of the surrounding tissue; but it seems more probable (as it is certain that the circumference of the chest becomes increased from prolonged residence in these localities) that the permanent lung expansion is due to more complete dilatation of groups of air-cells which, probably, are little used in ordinary respiration on the sea-level, and so the whole lung expands within certain possible limits, and naturally fills up the space yielded by contracting, cicatrising lung substance.

The cases suitable for treatment in these elevated regions must be selected with great care and discrimination; and regard must be had rather to the constitution and temperament of the individual than to the mere amount of local disease. Hereditary pre-

disposition, other circumstances being favourable, offers no counter-indication to the suitability of these stations. But their remedial power is especially manifested in persons who have become accidentally the subjects of chronic lung disease, and who were the possessors of an originally sound constitution, and have obvious reserve stores of physical vigour: the constitution must have the power of healthy reaction to the exciting stimulants here applied to it.

In cases in which there is an obvious and well-ascertained *predisposition* to consumption, and where perhaps a slight hæmorrhage has occurred without the manifestation of any definite local disease, as a *preventive* measure a residence for two or three seasons in a high mountain station is to be recommended.

In apical catarrhs in young people, especially in the early stage, without much constitutional disturbance, the best results may be looked for if the treatment is commenced in the summer. But cases febrile from the commencement, and of nervous and excitable temperament, must not be sent to high altitudes.

Chronic inflammatory indurations and infiltrations of limited portions of the lung, often the result of acute congestion and inflammation, are especially suitable; not so, however, if a considerable extent of lung is the seat of tuberculous disease, or if, owing to the extent of lung involved and consequent changes in the sound lung, there is much dyspnœa.

We have, however, observed that advanced chronic cases, when the disease, though advanced, is limited to one lung, and there is little or no fever, and a certain amount of muscular activity and nervous energy are retained, often do well in these mountain stations; they will live there in tolerable comfort for years, losing ground, however, immediately they descend to lower regions.

Certain chronic one-sided cavity cases, in fairly vigorous young subjects, with a tendency to fibroid changes in the surrounding lung, form very suitable

and hopeful cases for high altitudes. Contraction of the cavity and cicatrisation of the surrounding lung substance, with expansion of the adjacent healthy lung tissue, often take place with considerable rapidity.

The following is Sir H. Weber's classification of *unsuitable* cases: "(1) Consumptive patients who belong to what I have described as the erethic constitution, whether the affection is early or advanced; (2) phthisis in a very advanced stage; (3) phthisis complicated with emphysema; (4) phthisis complicated with albuminuria; (5) phthisis complicated with disease of the heart; (6) phthisis with ulceration of the larynx; (7) phthisis with rapid progress and constant pyrexia; (8) phthisis with great loss of substance; (9) phthisis with considerable empyema; (10) phthisis in persons who cannot sleep or eat in high elevations, or who feel constantly cold."

In this last group we are again brought into contact with individual peculiarity as a determining condition in the choice of climate; for the members of this group, who cannot exist in comfort and whose nutrition is compromised in Alpine stations, we have to seek other residences; some of these may do well in the so-called "intermediate" stations, such as Montreux, Glion, Meran, Göbersdorf, Aussee, etc., while others will find the warmer climate of the stations of the Western Riviera more suitable.

Very little is at present known of the results attending the wintering of phthisical patients at **intermediate** stations. Some good results have followed a winter residence at Mont de Caux and at the Hôtel des Avants, both situated above Montreux, on the Lake of Geneva, at elevations varying between 3,000 and 3,700 feet. The same may be said of the Kurhaus of St. Beatenberg (3,700 feet), and the Bär Hotel at Grindelwald. Meran (about 1,000 feet) has a cold, dry, sub-Alpine winter climate, and many invalids with chest affections winter there with benefit. The

Kurhaus there is provided with an excellent system of compressed-air baths, and regular pneumatic treatment forms a part of the course carried out. The several adjacent villages which compose Montreux, at the eastern extremity of the Lake of Geneva, have been found good winter stations for a few cases of chronic phthisis in fairly vigorous persons, with whom a cold, moderately dry pure air agrees best in winter. Innsbruck also is suitable for such cases.

We have mentioned that there are many suitable stations for consumptive patients at considerable altitudes in the American continent, for those who do not mind travelling as far as the Peruvian Andes, the Cordilleras, or the Rocky Mountains of the United States. Sir Hermann Weber says that several of his patients "have recovered from rather advanced affections of phthisis" in the neighbourhood of Jauja and Huancayo, at elevations varying from 8,500 to 10,500 feet. These are the two chief resorts for consumptive patients from Lima. The climate of these stations is much more genial, and altogether very unlike that of the Swiss Alps at considerably lower elevations. The equability of temperature at Jauja is very remarkable; the range during the whole year has been observed "not to exceed from 50° to 59° or 60° F.; with the sky always clear and sunny, and an atmosphere pure and bracing." "From no other localities," says Sir H. Weber, "have I seen such good results as from Jauja."*

Denver (5,200 feet), in the Rocky Mountains, presents special advantages as a residence for a certain class of consumptives—for those, we mean, who cannot afford to lead idle lives, and who possess sufficient strength and energy to enable them to engage in active business pursuits. But for those who do not wish to engage in business pursuits and whose sole object is the restoration of health, Colorado Springs (6,000 feet) is more suitable. Wind and dust are very troublesome at these and other Rocky

* Croonian Lectures.

Mountain resorts; and bronchial catarrh is said to be very prevalent at Denver.

We have next to consider what are the best resorts for **more advanced** cases of phthisis than those we have been thinking of, or in which the general health is more seriously compromised; as well as for those persons who, from individual peculiarity or other good reason, cannot support the climate of altitudes, or the more hardy life involved in a sea-voyage, or settlement in an out-of-door life in one of the British colonies—resorts which may contribute, if not to regressive changes, at any rate to the arrest of the disease, and the restoration, in some measure, of constitutional tone and vigour. The resorts we now have to consider will also frequently have to be made use of for cases of threatening disease in feeble constitutions, as well as for those lingering, advanced cases of chronic phthisis in which our only hope is to maintain, if possible, the *status quo*, and to provide a refuge where the last years of the patient's life may be made as pleasant and comfortable as possible.

The extremely dry winter climate of Upper Egypt and Nubia, and the expedient of a voyage up the Nile in a dahabeeah, have, certainly, proved of great value to many sufferers from chronic phthisis. From November to April the climate of Egypt used to be considered "the finest in the world," but since attention has been so strongly diverted to mountain stations the Nile voyage has come to be regarded with much less enthusiasm, and the long and expensive journey from England has always presented a difficulty, insurmountable in many cases.

The sea-voyage is also an obstacle to many. The winter climate of Egypt is suitable for cases of chronic, stationary phthisis in persons of torpid or scrofulous constitution, with catarrhal tendencies, who are active enough to enjoy travel. The command of a certain amount of means is also necessary, and if they venture on the Nile voyage they should be accompanied by a medical attendant. They should

be cautioned about remaining long in Cairo, where the dust and dirt may prove injurious; but good accommodation can now be obtained at Heluan les Bains, a few miles from Cairo, and in the hotels at Ména, Luxor, and Assouan.

Pau has also an inland climate, but with very different characters from that of Egypt. Pau has a moist, sedative climate, Egypt a dry, exciting one. Remarkable stillness of atmosphere is considered to be the chief characteristic of the climate of Pau. It has a large rainfall, and a goodly number of rainy days. Its average winter temperature is but little higher than that of London—viz. 43·2° F.—and it is occasionally visited by severe storms, and frost and snow are by no means uncommon in winter. It must be remembered that its climate is sedative, not bracing, and that its special suitability is for those patients whose disease is quiescent, with irritable nervous systems, and a tendency to febrile excitement. Its adjacency to the Pyrenean summer resorts and sulphur spas is convenient for such invalids as pass their winter at Pau and their summer at Eaux Bonnes, Bagnères de Bigorre, or some other Pyrenean bath.

Amélie les Bains is another inland winter resort for the phthisical, almost exclusively frequented by French and Spanish patients. It is close to the Spanish frontier in the Eastern Pyrenees. It lies in a protected situation at an elevation of 700 feet above the sea; its climate is intermediate in character between the sedative one of Pau and the more exciting one of the Riviera. It is warmer than Pau, but has more wind, and its temperature is less equable. It has hot sulphur springs, and it is, therefore, a convenient winter resort for patients with phthisis who desire to combine the use of sulphur waters with a mild winter climate. Life at Amélie is very simple and inexpensive.

The **maritime**, insular, or littoral climates convenient and suitable as winter resorts for the

phthisical may be divided into three groups: (*a*) sedative marine climates; (*b*) stimulating marine climates; and (*c*) intermediate climates.

The practical selection and applicability of these climates must be determined rather by considerations of constitutional and individual peculiarities than by considerations drawn from the physical changes in the lungs. The influence of climates and their reactions on certain individuals are so subtle that it is scarcely possible to determine absolutely, before actual trial, in these doubtful cases, whether a particular resort will be found suitable or not.

The *sedative* group are characterised by greater equability of temperature, greater freedom from strong winds, a considerable amount of relative humidity, and generally a tolerably large rainfall distributed over a considerable number of rainy days. The *stimulating and tonic* group present wide diurnal variations of temperature, and considerable difference between sun and shade temperatures, a great fall of temperature at sunset, relatively cold nights, great sun-heat, frequent high winds, a small winter rainfall, and relative dryness of atmosphere.

The characteristics of the third or *intermediate* group are sufficiently indicated by their designation; it is, however, scarcely necessary to say that some examples of this group approach more nearly to the sedative, and others to the stimulating class.

So far as it is possible to generalise in this matter, it may be said that the climates of the *sedative* group are best suited to nervous, irritable constitutions, those who sleep and digest badly in exciting air, whose mucous membranes are irritated by sudden changes of temperature and exposure to strong winds, or by excessive dryness of atmosphere.

The *stimulating* tonic group are best suited to young, anæmic cases, and to torpid, scrofulous constitutions, in which the variability of temperature, the dry air, the bright sunshine, and the changing winds serve as stimulants to the languid circulation, and

promote nutrition and sanguification; while the *intermediate* group form a very valuable class of climates applicable to a wide range of cases, in which there is no very strongly marked individual peculiarity, certain members of this group being suitable for the same cases as the other two, according as they approach in their characteristics the one or the other division.

On the English coasts the winter resorts suitable for phthisical patients belong most of them to the sedative class, differing slightly from one another, but not greatly. Those to the west—Falmouth, Penzance, Torquay, Tenby—are more sedative than those to the east—as Ramsgate, Hastings, and St. Leonards; while Ventnor, Bournemouth, Sidmouth, and Teignmouth may be regarded as intermediate.

Patients who do not tolerate too close proximity to the sea can, at Bournemouth and Torquay, find suitable accommodation at some distance from the shore. The sandy soil and the pine woods of Bournemouth confer on it some special qualities; the rainfall rapidly drains away through the porous soil, and leaves the atmosphere therefore somewhat drier than it otherwise would be, and the pine trees give out balsamic emanations in warm sunshine—both circumstances favourable to catarrhal cases and cases of laryngeal irritation.

St. Leonards is specially adapted to those persons who complain that they find the atmosphere of Torquay and Bournemouth too relaxing, and who derive positive benefit from a somewhat more bracing quality of climate.

The success that has attended the treatment of a great number and variety of phthisical patients at Ventnor, in the admirably-arranged and well-conducted Hospital for Consumptives established there, shows that its winter as well as summer climate is well suited to the majority of cases of chronic phthisis.

Arcachon, on an enclosed sea basin, a few miles from the south-west Atlantic coast of France, is applicable to much the same class of cases as is the English

resort, Bournemouth. It has a decidedly sedative climate, but it cannot be said to be relaxing, as the winds and storms from the Atlantic blow over it, and at times keep up a good deal of agitation in its atmosphere. The winter residences are, however, protected to a great extent by the pine woods amongst which they are built. It is a rather dull resort to pass the winter in, but it has the advantage of being easily got at and easily left.

Biarritz is far too windy, wet, and stormy a climate for the average phthisical patient to think of wintering in.

One of the most perfect of sedative marine climates is that of Madeira, with its warm, moist, and equable atmosphere, exceedingly suitable for certain forms of phthisis, especially those with a tendency to bronchial catarrh and irritability. It has the further advantage of enabling patients to ascend during the warmer season to residences at various elevations above the sea, up to 2,000 feet or more, so that certain patients can remain there the whole year—an important consideration in many cases.

Mogador and Tangier, in Morocco, possess much the same climatic characters as Madeira, with a somewhat drier atmosphere, and somewhat less sedative qualities. Fair accommodation may be obtained at the latter resort, but it would not be prudent to rely on finding suitable provision for invalids at Mogador.

Malaga would be an admirable resort for many cases if it were not so ill provided with suitable means for invalids to live an open-air life.

Orotava, Guimar, and Tacoronte, in the island of Teneriffe, are good winter stations for those consumptive patients who need a warm sedative climate. Teneriffe is about twenty-eight hours' journey from Madeira, and, like that island, presents the possibility of residence at varying degrees of elevation above the sea, and has extremely beautiful and picturesque surroundings. Guimar is 1,200 feet and Tacoronte 1,700 feet above the sea level.

Las Palmas, in Grand Canary, has a drier and more bracing climate, and is preferred, therefore, by some. Occasional dust storms there are said to be trying. Monte, a short distance from Las Palmas, is over 1,300 feet above the sea.

Ajaccio, Palermo, Taormina, Acireale, Catania, Corfu, Capri, are examples of intermediate climates suitable for cases of chronic stationary phthisis that find the resorts of the Riviera too dry and exciting, and yet require a drier atmosphere than that of Madeira.

The climate of Algiers is also an example of the intermediate group, and is applicable to a great number of cases. The agreeable situation of its suburb—Mustapha-supérieur—where most invalids take up their abode, combines the advantage of life in the country with the adjacency of a large town. It is possible, too, to stay through the entire year in Algiers, either by removing to Hammam R'irha during the hottest months of summer, or by remaining in the highest part of Mustapha.

Biskra, for those who need a warmer and drier climate than Algiers in winter, is readily reached from the latter.

The various resorts on the French and Italian Riviera present us with examples, differing in certain degrees from one another, of the stimulating and tonic group.

We have already pointed out their characteristics, and the class of cases to which they are applicable.*

Finally, we will only add that, according to the mode of life followed by the phthisical patient, he may make bad use of a good climate, or good use of a bad one, and that care without climate is better than climate without care.

* Further information about these resorts will be found in the author's work on "The Therapeutics of Mineral Springs and Climates."

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Printed by Cassell & Co., Limited, La Belle Sauvage, London E.C.

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Author Yeo, Isaac Burney
Title A manual of medical treatment. Ed.5. vol.1.

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